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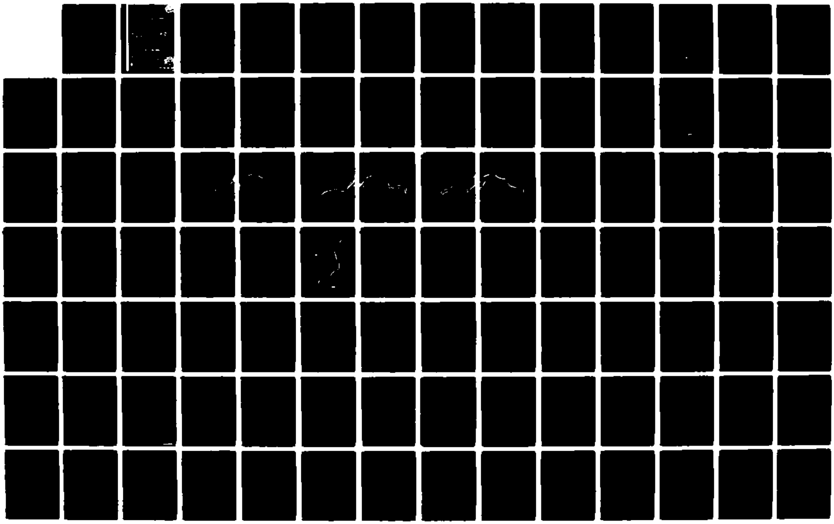

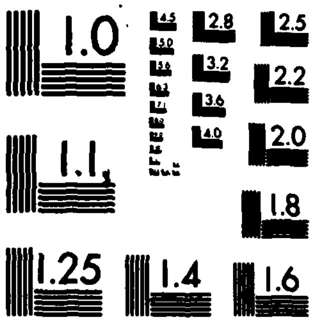

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CLASSIFICATION OF COASTAL ENVIRONMENTS

TECHNICAL REPORT 27

MID-ATLANTIC MICROTIDAL BARRIER COAST CLASSIFICATION

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COASTAL SCIENCES PROGRAM

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ABSTRACT

Data for twenty-seven geomorphic and coastal-process attributes were collected at 1-km intervals for 800 kilometers of the mid-Atlantic barrier coast between Cape Henlopen, Delaware, and the North Carolina-South Carolina border. Correlation and principal component analysis was run on fifteen of these attributes in an attempt to classify the coast.

Local subregions (between 55 km and 190 km in length) showed organization and interrelationships. These relationships are not as clear when the entire 800-km data set is considered in the same analysis, indicating that coastal geomorphic and process systems are in adjustment to local environmental conditions to a greater extent than they are to regional conditions.

The large number of variables resulted in a classification of the mid-Atlantic coast into twenty-four distinct barrier types based on process and morphology. A coarser classification of the area identifies seven types based on attributes of coastal strike, sediment size, offshore slope, wave frequency, shoreline erosion, inlet frequency, and offshore bars.

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ACKNOWLEDGMENTS

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INTRODUCTION

In 1971 we began an investigation of regional-scale variations of the sedimentary landforms along the Atlantic coast under sponsorship of the Office of Naval Research. To date we have reported on variations in coastal landforms (Dolan et al. 1975); offshore bathymetry (Resio et al. 1977); barrier island topography (Vincent et al. 1976); inshore bathymetry (Dolan et al. 1977); equilibrium profiles (Felder et al. 1979), coastal marine fauna (Hayden and Dolan 1976), and shoreline erosion and shoreline configuration (Dolan et al. 1977; Hayden and Dolan 1979; Dolan et al. 1979), and more recently, Atlantic coast wave climates (May et al. 1983).

The substantial data inventories developed from these studies provided the basis for classifications of regional-scale coastal environments and landform types (Dolan et al. 1975), and barrier islands, lagoons, and marshes, (Hayden and Dolan 1979). The resulting classification units were on the order 100 km to 300 km along the coast.

More recent data collections on coastal processes and responses were designed to analyze regional-scale associations at higher resolutions. Accordingly, an 800-kilometer section of the Atlantic coast was investigated. Fifteen attributes spaced at 1-km intervals form the data matrix which we analyzed using numerical classification procedures. The results are reported here.

MID-ATLANTIC MICROTIDAL BARRIER COAST CLASSIFICATION

DATA COLLECTION METHODS

The Study Area

The coastline under study extends approximately 800 km from Little River Inlet, North Carolina/South Carolina, to Cape Henlopen, Delaware, and encompasses the mid-Atlantic barrier islands of North Carolina, Virginia, Maryland, and Delaware (Figure 1, Table 1). Within the study area, 800 sample sites were designated at 1.0-km intervals. The sites were numbered 1 to 800 moving from south to north, and were identified by coordinates of latitude and longitude. Each site was also assigned a map and transect number corresponding to the University of Virginia Orthogonal Grid Mapping System (O.G.M.S.). The O.G.M.S. map and transect number specify the location of each site to the nearest 100 m along the coast on base maps prepared from U.S. Geological Survey 7-1/2 minute (1:24,000) series topographic maps. The most recent maps available were updated with 1976 aerial photography to show the shoreline position on a common date.

Selection of Variables

The first phase of this project was the identification of quantifiable attributes of the barrier coastline of North Carolina, Virginia, Maryland, and Delaware. The principal constraints on selection of the variables were: (1) variables

Figure 1. Map of the eastern United States showing location of the 800 km study area between Cape Henlopen, Delaware, and the North Carolina-South Carolina border.

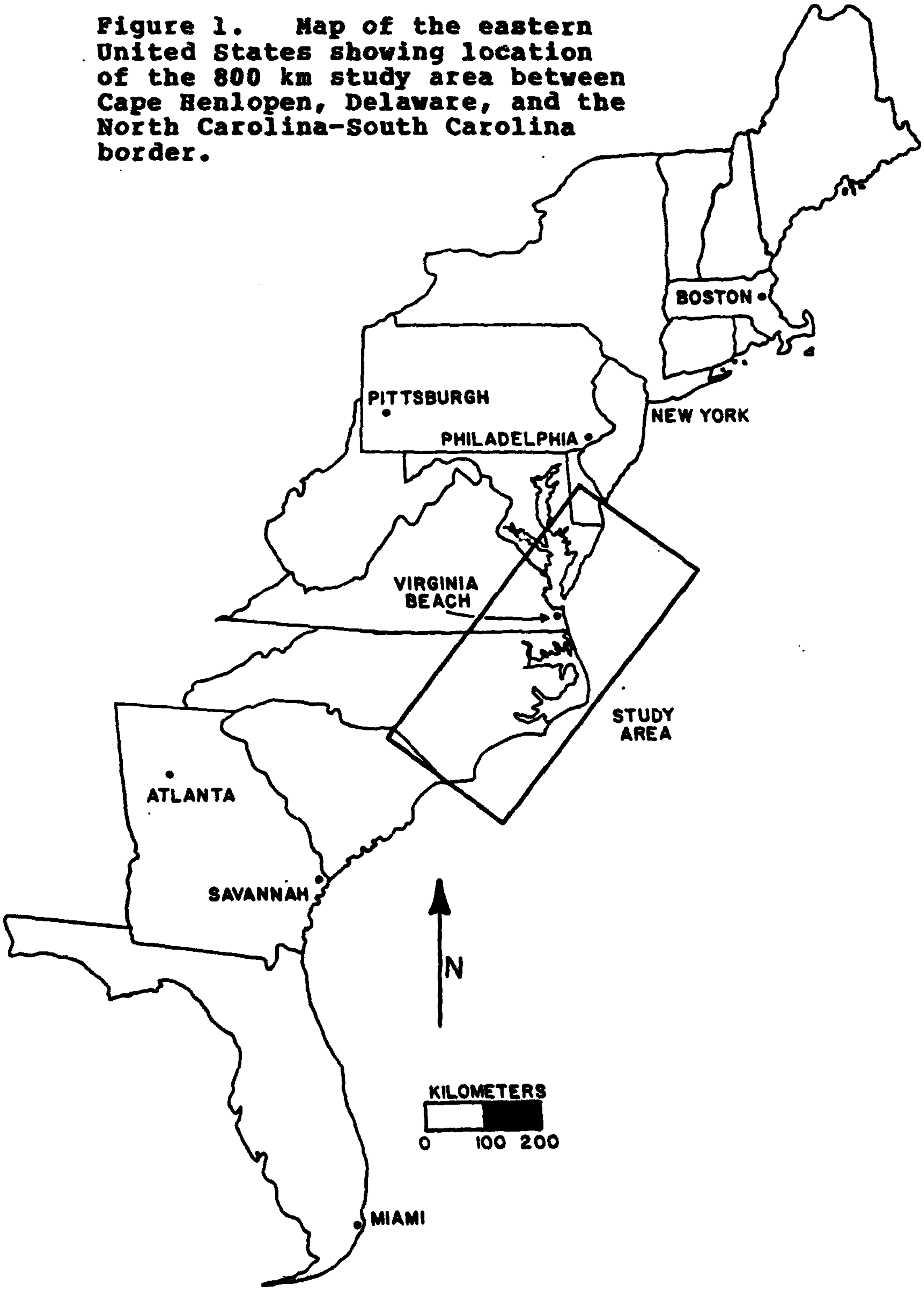


TABLE 1

MID-ATLANTIC BARRIER ISLANDS AND BEACHES

Cape Henlopen, DE
Rehoboth Beach, DE
Fenwick Island, DE-MD
Assateague Island, MD-VA
Wallops Island, VA
Assawoman Island, VA
Metomkin Island, VA
Cedar Island, VA
Parramore Island, VA
Hog Island, VA
Cobb Island, VA
Wreck Island, VA
Ship Shoal Island, VA
Myrtle Island, VA
Smith Island, VA
Fishermans Island, VA
Cape Henry, VA
Virginia Beach, VA
Sand Bridge, VA
False Cape, VA
Currituck Banks, NC
Bodie Island, NC
Pea Island, NC
Hatteras Island, NC
Ocracoke Island, NC
Portsmouth Island, NC
Core Banks, NC
Shackleford Banks, NC
Bogue Banks, NC
Hammock Island, NC
Browns Island, NC
Onslow Beach, NC
Ashe Island, NC
No Name Island, NC
Figure Eight Island, NC
Shell Island, NC
Masonboro Island, NC
Carolina Beach Island, NC
Smith Island, NC
Oak Island, NC
Holden Beach Island, NC
Hales Beach Island, NC
Sunset Beach Island, NC
Bird Island, NC

had to be quantifiable to be suitable for statistical analysis; (2) data on each variable for all segments of the 800-km study area had to be accessible through maps, bathymetric charts, aerial photographs, existing University of Virginia coastal data sets, or published literature; and (3) values for each variable had to be assignable to sites at 1-km intervals throughout the study area.

Twenty-seven variables were identified for data collection and analysis (Table 2). Eight of the variables represent physical processes acting in the coastal zone, and the other 19 variables are geomorphological attributes of the barrier coastline and adjacent water bodies.

Resolution of Variables

The twenty-seven variables in the coastal classification system can be divided into two distinct subsets based on the spatial resolution of the data that corresponds to each variable. Eighteen of the variables are classed as high resolution geomorphological variables. The other nine variables, eight of which are physical process attributes, are considered low resolution variables. The only low resolution geomorphic attribute is the slope of the continental shelf.

The arbitrary distinction between high and low resolution was made with the guideline that high resolution variables have been systematically measured at 1-km intervals along the coast, and their values are typically not constant over long stretches

TABLE 2

COASTAL CLASSIFICATION VARIABLES

Geomorphological Attributes	Coastal Process Variables
Shoreline Strike	Wave Frequency:
Topography:	1.5 m high
1.5–2.9 m Dune Frequency	3.4 m high
3.0–4.5 m Dune Frequency	Wind Frequency:
3.0 m Dune Frequency	Onshore
4.6–6.0 m Dune Frequency	Offshore
6.0 m Dune Frequency	Tidal Range
Island Width	10-year Storm Surge
Lagoon Width	Tropical Cyclone Frequency
Inlet Frequency	Hurricane Frequency
Offshore Slope:	
To 5.5-m Depth	
To 9.1-m Depth	
Bar Number:	
Mean	
Standard Deviation	
Rate of Shoreline Change:	
Mean	
Standard Deviation	
Overwash Penetration Distance:	
Mean	
Standard Deviation	
Sediment Size	
Shelf Slope	

of coastline. Quantifiable variation is usually present in high resolution variables along a 10 to 20 km length of coastline. For example, barrier island width can be measured at 1-km intervals on 1:24,000-scale maps, and typically varies along 10 km of shoreline. In contrast, the frequency of 1.5-m high waves is considered a low resolution variable because it varies slightly along small stretches of ocean shoreline, and local wave data is not available for much of the 800 km study area.

Data Variables

Geomorphic Variables (High Resolution)

Shoreline Strike

The strike, or orientation, of the shoreline was measured at each 1-km interval site. A visual "best-fit" straight line was drawn over the kilometer of shoreline south of each site on 1:24,000-scale U.S.G.S. topographic maps. The strike of this line was measured in degrees east of north. As examples, a north-south striking coast facing east (i.e., the ocean is to the east of the barrier island) has a strike of 0°; a coastline striking east-west and facing south has a strike of 90°; a north-south striking coast facing west has a strike of 180°; and an east-west striking coast facing north has a strike of 270°.

Inlet Frequency

The along-the-coast frequency of inlets was measured at each site by counting the number of inlets within a 24-km segment of coastline centered on the site. The mean length of mid-Atlantic barrier islands is approximately 12 km; therefore 24-km segments were used for inlet frequency counts to reflect the wide variability in inlet frequency along the mid-Atlantic coastline. The inlets were counted on 1:24,000-scale U.S.G.S. topographic maps updated with air photos to show the 1976 shoreline.

Topography

Five different measures of barrier topography were made on the most recent available U.S.G.S. 1:24,000-scale topographic maps: (1) frequency of dunes between 1.5-2.9 m, (2) frequency of dunes between 3.0-4.5 m, (3) frequency of dunes between 4.6-6.0 m, (4) frequency of dunes higher than 6.0 m, and (5) frequency of dunes higher than 3.0 m. These values were determined at each site by examination of the topography of a 1.0-km segment of the barrier to the south of the site. A transparent grid was placed over the 1:24,000-scale base map, dividing the kilometer under study into ten 100-m segments stretching across the island normal to the shoreline. The highest topographic contour intersecting each of the ten transects was recorded, and these data were converted into values for the five topographic intervals listed above. Only the most seaward dune field was considered in the counts. Back-barrier features such as Jockey's Ridge, North Carolina, were not considered.

As an illustration of the procedure, if the maximum elevation at five of the ten transects for a particular site was 3.0 m, in three transects it was 1.5 m, and in two transects it was less than 1.5 m, then the values for the five variables would be as follows:

(1) 1.5-2-9 m dune frequency = 30%

(2) 3.0-4.5 m dune frequency = 50%

(3) 4.6-6.0 m dune frequency = 0%

(4) greater than 6.0 m dune frequency = 0%

(5) greater than or equal to 3.0 m dune frequency = 50%

Using this method, the range of possible values for each variable in each case is 0% to 100%.

Offshore Slope

Offshore slopes to 5.5-m and 9.1-m depths were determined from the most current editions (1981 or 1982) of National Ocean Survey 1:80,000-scale bathymetric charts. The water depth was divided by the horizontal distance from the shoreline to the appropriate bathymetric contour measured normal to the shoreline strike to obtain the slope in m/km.

Bar Number

Thirteen sets of color infrared aerial imagery of the mid-Atlantic coast, between 1970-1979, were examined to determine predominant longshore bar patterns. None of the photo sets covered the entire study area. On the average, there were four photo sets used for bar analysis at each site. The plan-view bar morphology, as evidenced by the number and position of breaker lines, was mapped from all photo sets. Shoreline attachment points of the bars were also noted. After photo interpretation was completed, the mean number of bars and the standard deviation of the bar number was calculated for each site. (The complete bar analysis will be described in a separate ONR technical report).

Rate of Shoreline Change

The mean rate of shoreline erosion or accretion at each site was measured by the Orthogonal Grid Mapping System (O.G.M.S.). This system involves enlarging air photos of the coastline to a common scale (1:5,000), matching landmarks on the enlarged photos with features on 1:5,000 base maps prepared from U.S.G.S. topographic quadrangles, and tracing the shoreline (mean high water line) and vegetation line onto a transparent overlay. The mean and standard deviation of the rate of shoreline change is calculated by measuring the distance between an arbitrary base line on the base maps and shorelines traced from photos taken on various dates. Thorough explanations of the O.G.M.S. procedure and its reliability are given by Dolan et al. (1978, 1980).

For sites within the study area, the rate of shoreline change was determined from up to seven sets of aerial photos, dated 1938 to 1980. At all sites, photos spanning at least 25 years were mapped. In the O.G.M.S., shoreline positions are digitized at 100-m intervals along the shore, and rates of change are calculated at each of these 100-m transects. To make this data compatible to the 1-km interval sites used in this project, the O.G.M.S. shoreline change values at the ten 100-m transects immediately south of each site were averaged to yield a mean and standard deviation of the shoreline rate of change for the site.

Overwash Penetration Distance

The distance between the shoreline (mean high water line) and the vegetation line was also measured on the photos used in the O.G.M.S. This distance is known as the overwash penetration distance (OPDX), and it was calculated for each of the 1-km interval sites. As with the rate of shoreline change, values measured at 100-m interval transects were averaged over 1-km stretches adjacent to each site to produce a value for the mean and standard deviation of the overwash penetration distance at each site.

Overwash penetration distance has also been called the active sand zone width or unvegetated beach width. "Active" refers to the dynamic nature of the unvegetated beach. On this part of a barrier, aeolian sediment transport is a continual process, and overwash is an important, though infrequent, process. Many interrelated coastal attributes must be considered in site-level or regional-scale interpretation of overwash penetration distance data, including the frequency and character of overwash, the rate at which washover deposits are revegetated, dune stabilization, engineering structures, and other human alteration of barrier islands.

Sediment Size

A lengthy review of the literature on mid-Atlantic beach sediments revealed that there was no single high-resolution sediment sampling study that covered the entire 800-km study area. Consequently, average sediment size data were extracted from four sources in the literature and from the unpublished results of four coastal field studies. Table 3 lists the sources of sediment data used for each segment of the study area.

The sediment data sources were chosen on the basis of the extent of the sampling, the spacing of the sample sites, the part of the beach that was sampled, and the nature of the grain size statistics that were calculated. In all cases, the samples

TABLE 3

SEDIMENT SOURCES

Source	Coastal Segment
University of Virginia 1982	NC-SC line to Bogue Banks, NC
Giles and Pilkey 1965	Shackleford Banks, NC, to Cape Lookout, NC
University of Virginia 1977	Cape Lookout, NC, to Portsmouth Island, NC
University of Virginia 1976	Ocracoke Island, NC, to Nags Head, NC
Shideler 1973	Nags Head, NC, to VA-NC line
Swift et al. 1971	VA-NC line to Cape Henry, VA
Ingram 1975	Fisherman's Island, VA, to Wallops Island, VA
University of Virginia 1976	Assateague Island, VA/MD
Maurmeyer 1981	Ocean City, MD, to Cape Henlopen, DE

were collected from the upper foreshore near the berm crest.

There are numerous beach sediment studies of single sites or individual islands reported in the literature that provide detailed information for small segments of the coast. However, for the purposes of this study we chose the data sources that are most likely to reveal the regional-scale variability of beach sediment textural trends along the mid-Atlantic coast, while keeping sampling biases to a minimum.

Island Width

Island width was measured at each site on 1:24,000-scale U.S.G.S. topographic maps that had been updated with air photos to show the 1976 shoreline configuration. The width from the ocean shoreline to the bay shoreline was measured perpendicular to the shoreline strike.

For mainland-attached beaches, such as Virginia Beach, Virginia, the mean overwash penetration distance was used as a substitute measure for island width. The rationale for this substitution is that the morphodynamic character of the unvegetated portion of a mainland-attached beach is functionally similar in many ways to that of a barrier island.

Lagoon Width

The width of the water body (lagoon, bay, sound, etc.) separating the barrier from the mainland was measured at each site on 1:24,000-scale U.S.G.S. topographic maps. These distances were measured from the bay shoreline of the barrier to the bay shoreline on the mainland. The measurement at each site was made perpendicular to the ocean shoreline strike of a 3-km segment centered on the site. For mainland-attached beaches the lagoon width is zero.

Shelf Slope

The slope of the continental shelf was determined by measuring the distance from the ocean shoreline to the 183-m (100-fathom) depth contour. The measurements were made on small-scale National Ocean Survey nautical charts (1:416,994 and 1:1,200,000 scale). Shelf slope is a relatively low-resolution attribute compared to the other geomorphic variables because it does not vary appreciably between adjacent 1-km sites. Rather than measuring shelf slope at each of the 800 study sites, the study area was divided into 30 "orientation segments" by drawing best-fit lines on a 1:1,000,000-scale map of the region (Figure 2). Within each orientation segment the coastline is nearly straight. The endpoints of these segments are points that coincide with major shifts in shoreline strike.

The distance from the shoreline to the 183-m depth contour was measured along a line perpendicular to, and bisecting, each of the 30 orientation segments. The vertical difference (183 m) was then divided by the horizontal distance measures, and the 30 resulting shelf slope values were assigned to the corresponding 1-km interval sites within each of the orientation segments.

Coastal Process Variables (Low Resolution)

Wind Frequency

The percentages of onshore winds and offshore winds greater than two knots were calculated for each of the 30 orientation segments in Figure 2, using coastal wind data from stations at Salisbury, Maryland, Wallops Island, Virginia, Virginia Beach, Virginia, Cape Hatteras, North Carolina, and Myrtle Beach, South Carolina (Garstang et al. 1978). Winds of less than two knots were considered to have negligible sediment transport capacity. The data from the nearest wind station were applied to each orientation segment, and the orientation of the best-fit line defining the segment was used as a criterion to determine which wind directions to consider onshore and offshore. For each segment, two of the 16 compass directions were classed as alongshore, and the other 14 wind directions were divided evenly between onshore and offshore. Once the onshore and offshore percentages were computed for a particular coastal segment, the values for these two variables were assigned to all the 1-km interval sites within the orientation segment.

Wave Data

Wave data from the Summary of Synoptic Meteorological Observations (S.S.M.O) were used to calculate the percentage of deep-water waves greater than or equal to 1.5-m high and the percentage greater than or equal to 3.4-m high within each of

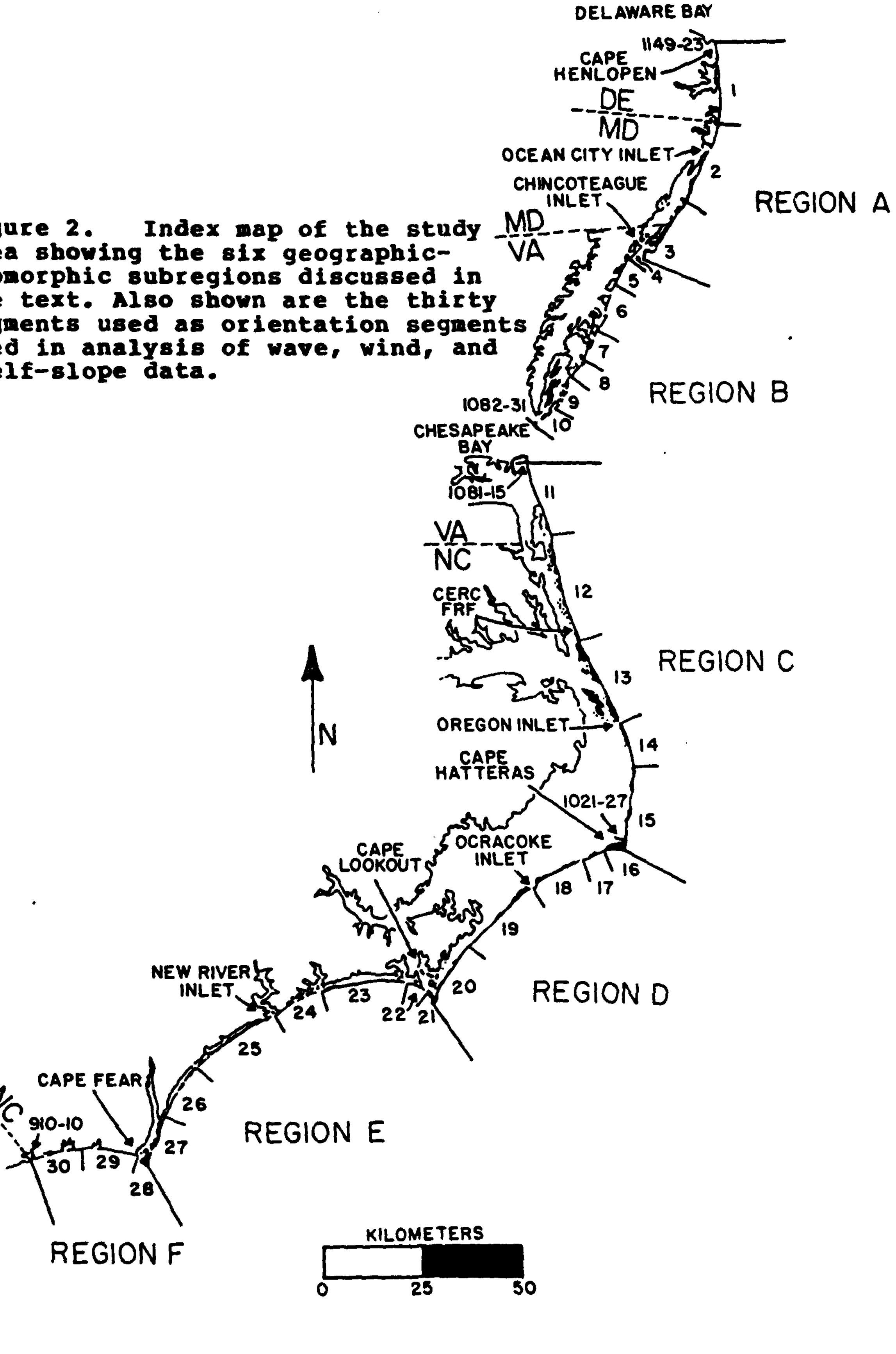


Figure 2. Index map of the study area showing the six geographic-geomorphic subregions discussed in the text. Also shown are the thirty segments used as orientation segments used in analysis of wave, wind, and shelf-slope data.

the 30 orientation segments (U.S. Naval Weather Service Command, 1975). Offshore-directed waves were not included in the count. Data from S.S.M.O. areas #15 (Atlantic City, New Jersey), #16 (Norfolk, Virginia), #17 (Cape Hatteras, North Carolina), and #19 (Charleston, South Carolina) were applied to each orientaton segment within the respective areas. All 1-km interval sites within each segment were given the values for the two wave variables that were calculated for that segment.

Tidal Range

The mean tide range at each study site was estimated by plotting mean tide ranges at all National Ocean Survey open-coast tide stations (NOAA/National Ocean Survey 1982) on 1:1,000,000-scale base maps, and interpolating values at all sites located between adjacent tide stations. Factors such as inlets, embayments, and major changes in coastline orientation were taken into consideration in tide range estimations.

Ten-Year Storm Surge Height

Local values for the storm surge heights with a return period of ten years were extracted from three NOAA studies of storm tide frequency along the mid-Atlantic coast (Ho and Tracey 1975a, 1975b; Ho et al. 1976). Storm tide height frequencies were computed by NOAA using: (1) the National Weather Service numerical-dynamic storm surge prediction model applied to a full set of climatologically representative hurricanes, and (2) tide gage records of winter (extratropical) storms for locations north of Cape Lookout, North Carolina. Hence, the ten-year storm surge height for sites in Delaware, Maryland, Virginia, and North Carolina north of Cape Lookout were calculated by taking all storms into consideration. South of Cape Lookout, where the relative frequency and magnitude of tropical cyclone-generated storm surges is significantly greater than storm surges from extratropical storms, Ho and Tracey (1975a) considered only hurricanes in the storm-surge frequency analysis. The surge heights were computed in meters above mean sea level.

Tropical Cyclone and Hurricane Frequency

The number of tropical cyclones (i.e., all tropical storms and hurricanes) and the number of hurricanes making landfall between 1886 and 1982 within 92.7-km (50 nautical-mile) segments of the study area were obtained by updating the totals reported by Simpson and Lawrence (1971). Tropical cyclone information for 1972-1982 was gathered from Neumann et al. (1978) and the National Weather Service's annual Atlantic-Caribbean-Gulf of Mexico Hurricane Track Charts. The updating was done by the Simpson and Lawrence (1971) method, in which tropical storms (sustained surface winds 62 to 118 km/hr) are counted only in the 92.7-km coastal segment in which the storm makes landfall, but hurricanes (winds greater than 118 km/hr) are counted in the segment in which the hurricane makes landfall and in the adjacent segment to the right (i.e., north) of landfall. This procedure takes into account a hurricane's destructive effects in the right-forward quadrant of its path as the hurricane moves onshore. The tropical cyclone frequency and hurricane frequency values obtained for each 92.7-km coastal segment were assigned to all 1-km interval sites within the segment.

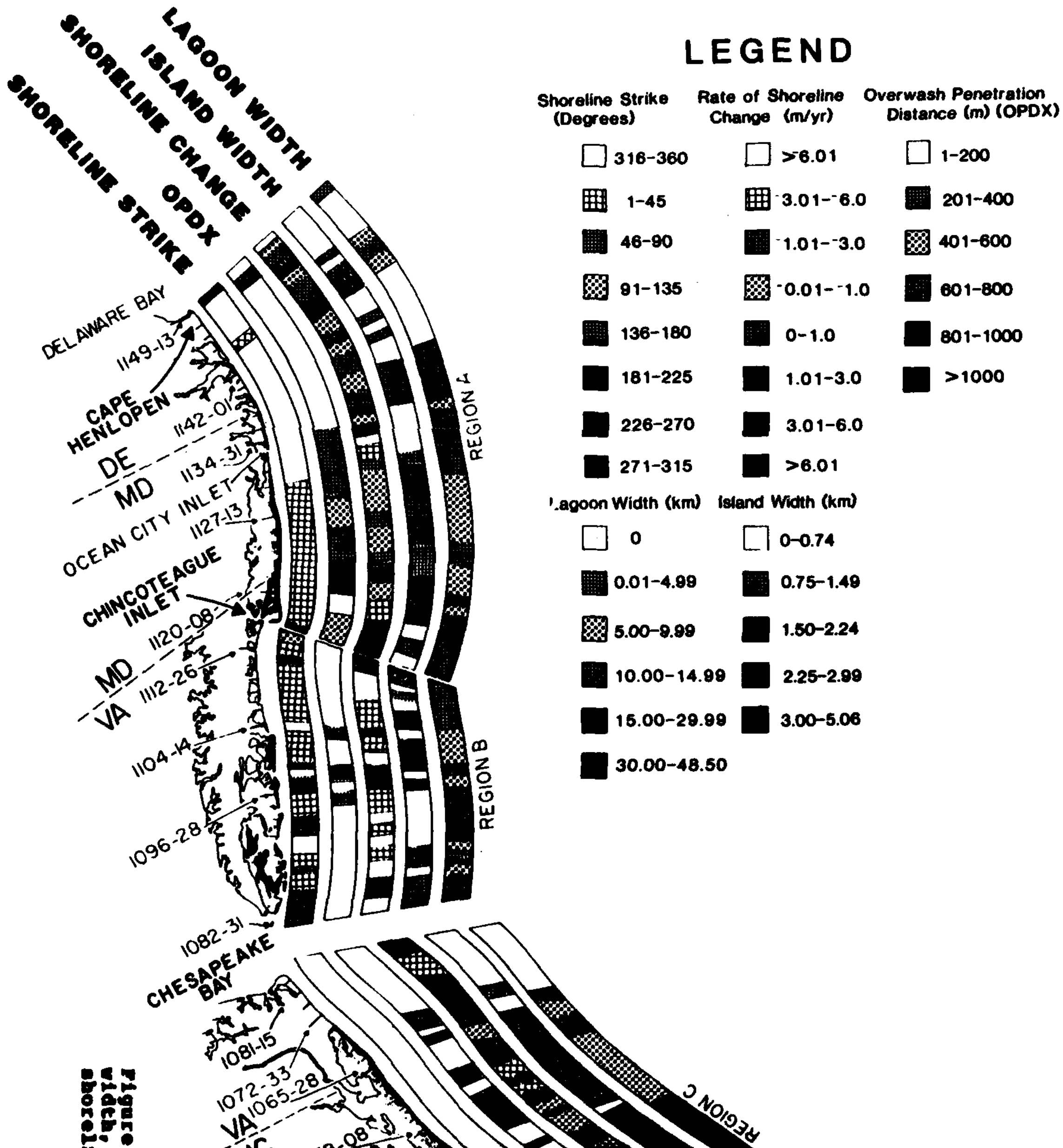
REGIONAL-SCALE SPATIAL VARIATION

Initial analyses of the entire 27-variable data set along the 800 km mid-Atlantic study reach (Table 2) showed that the data matrix could be substantially reduced without significant loss of information. This reduction was possible because many of the parameters have very poor spatial resolution (i.e., tropical cyclone frequency, hurricane frequency, and wind data). Other variables provided unnecessary resolution scales that could be represented by one inclusive value without significant information loss, i.e., frequency of dunes of various elevations can be represented by the frequency of dunes above 3 m. The 3 m elevation is an approximate boundary between high profile and low profile barrier islands in the study area. Other variables are merely standard deviations of one of the mean parameters. The reduced data matrix includes 15 variables (see Table 4). Figures 3, 4, and 5 illustrate the spatial variation in the 15 study parameters along the mid-Atlantic coast from Cape Henlopen, Delaware, to the North Carolina-South Carolina border. Each of the figures contains data for five parameters and has been divided into six geographic sub-regions corresponding to later discussions of regional classification. For graphical purposes, the data have been smoothed by grouping the values into classes representing a range of values. The actual data can be found in Appendix A for all 15 variables.

TABLE 4

VARIABLES USED IN ANALYSES

Symbol	Variable Name	Definition (Units)	Significance of Change
STRK	Shoreline Strike	Azimuth orientation of shoreline strike (degrees) 0 = north	(See text for explanation of strike)
DFQ3	Dune Frequency	Percentage of dunes greater than 3-m elevation (%)	+ increasing island topography - decreasing island topography
INFQ	Inlet Frequency	Number of inlets within 24 km of coast centered on the site	+ higher alongshore inlet density - lower alongshore inlet density
OPDX	Overwash Penetration Distance	Distance from shoreline (m) to dense vegetation boundary	+ greater overwash penetration - less overwash penetration
RSLX	Rate of Shoreline Change	Mean rate of shoreline change over period of available air photo coverage (m/yr)	+ greater accretion - greater erosion
TRDG	Tidal Range	Mean tidal range (m)	+ greater tidal range - lower tidal range
STSG	Storm Surge	Maximum 10-yr storm surge (m)	+ greater storm surve elevation - lower storm surge elevation
SEDS	Sediment Size	Mean grain size of beach sediment (mm)	+ coarser sediment - finer sediment
OFS5 OFS9	Offshore Slope	Mean offshore slope measured from shoreline to the 5.5-m and 9.1-m depth contours (m/km)	+ steeper offshore slope - gentler offshore slope
ISLW	Island Width	Island width (km)	+ wider island - narrower island
LAGW	Lagoon Width	Lagoon width (km)	+ wider lagoon - narrower lagoon
WFQ1 WFQ3	Wave Frequency	Percentage of onshore and alongshore waves greater than 1.5-m and 3.4-m (%)	+ greater frequency of storm waves - lower frequency of storm waves
Bars	Mean Bar Number	Mean number of bars observed on available air photos	+ greater number of bars - fewer bars



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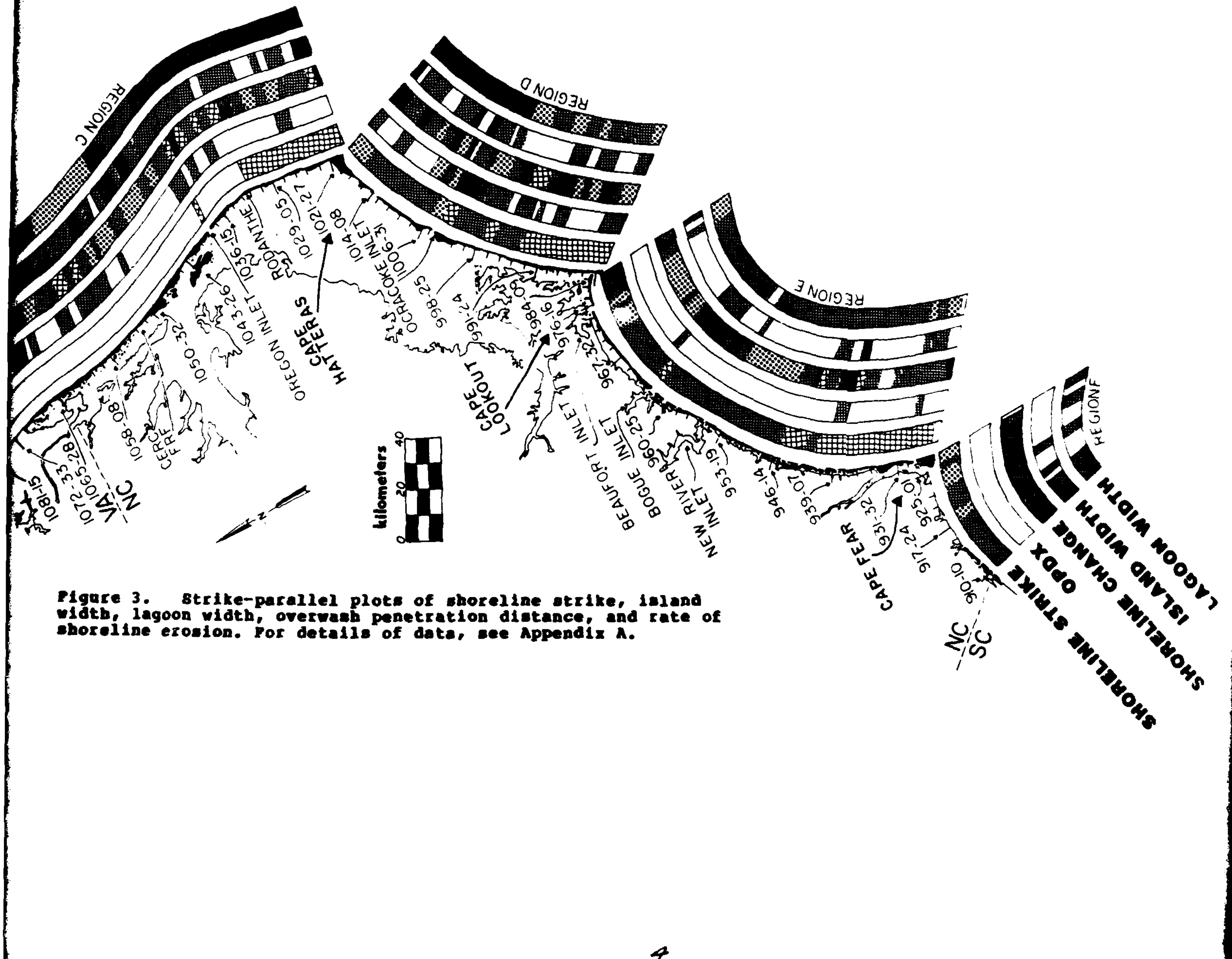
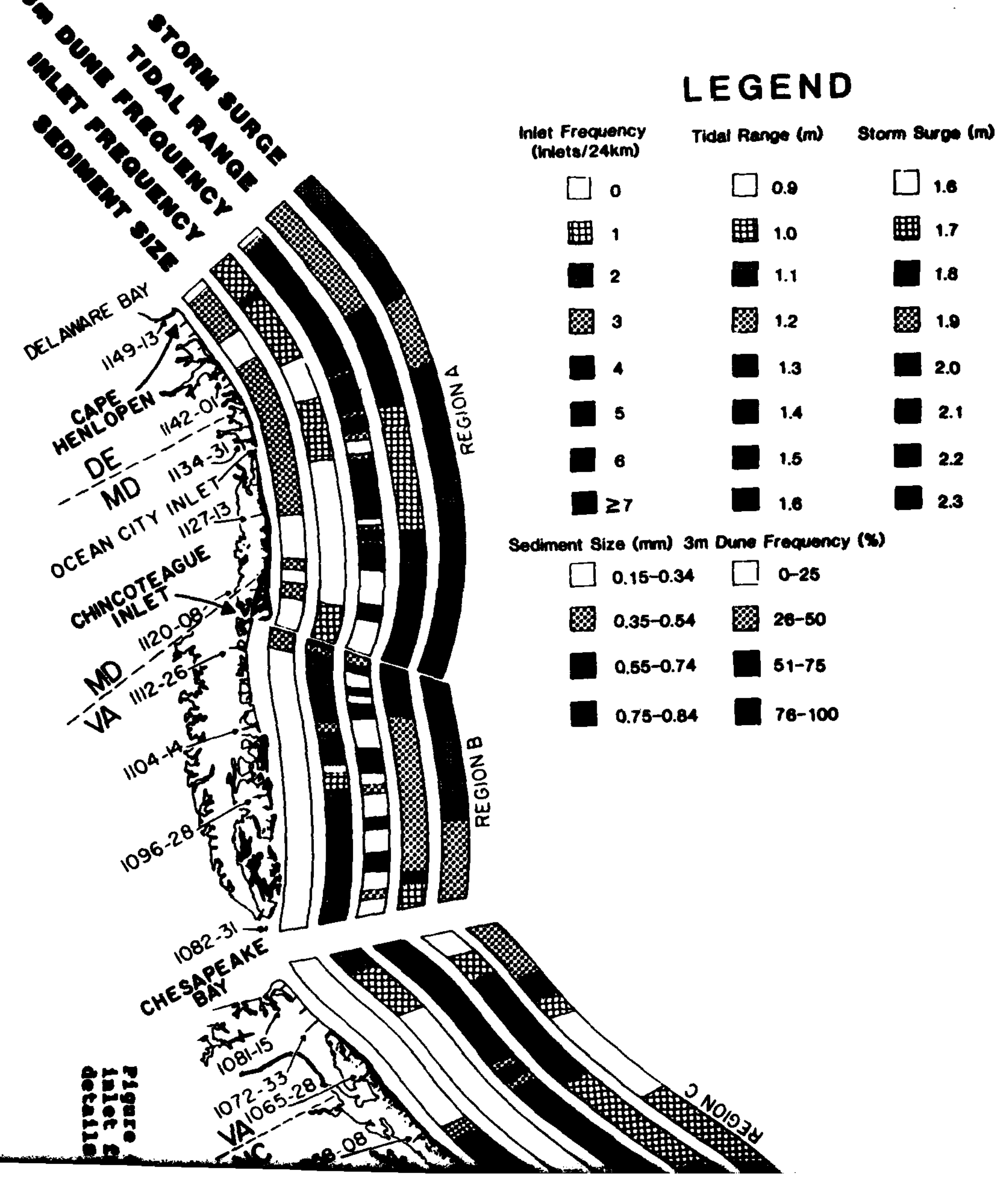


Figure 3. Strike-parallel plots of shoreline strike, island width, lagoon width, overwash penetration distance, and rate of shoreline erosion. For details of data, see Appendix A.



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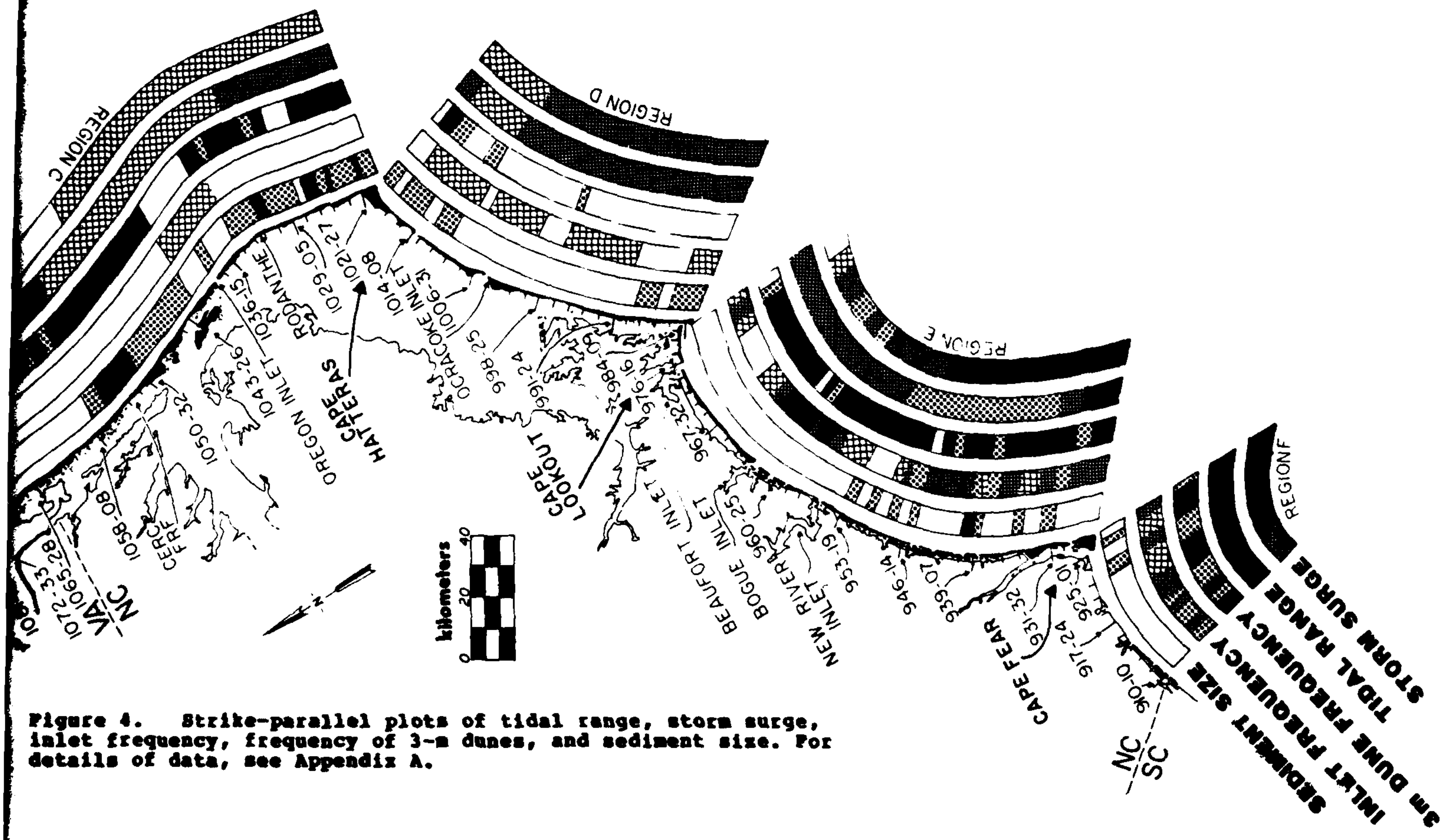
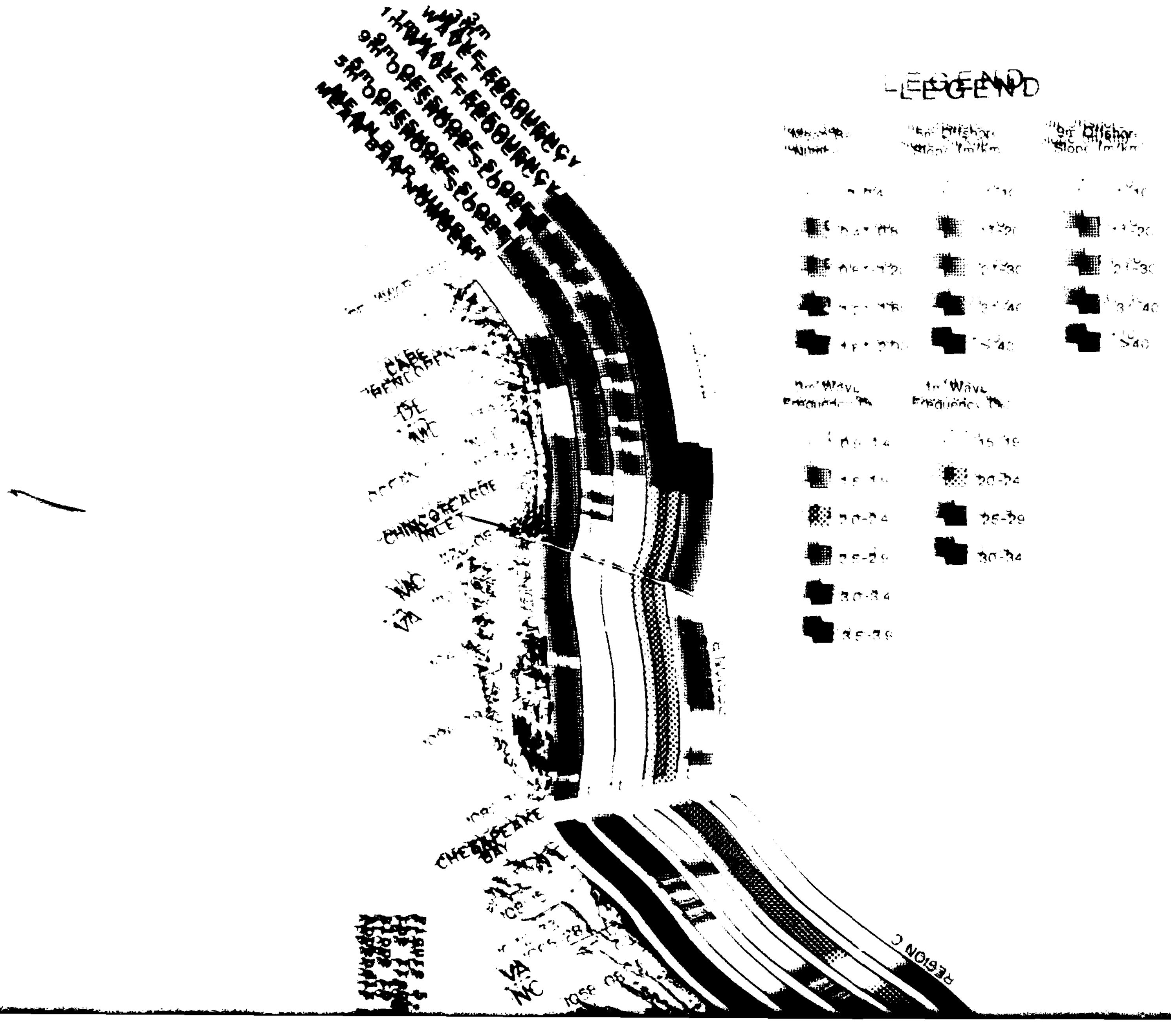


Figure 4. Strike-parallel plots of tidal range, storm surge, inlet frequency, frequency of 3-m dunes, and sediment size. For details of data, see Appendix A.

2

1


LEGEND
33m WAVE FREQUENCY
11m WAVE FREQUENCY
9m OFFSHORE SLOPE
5m OFFSHORE SLOPE
MEAN BAR NUMBER
CAPE HENLOPEN
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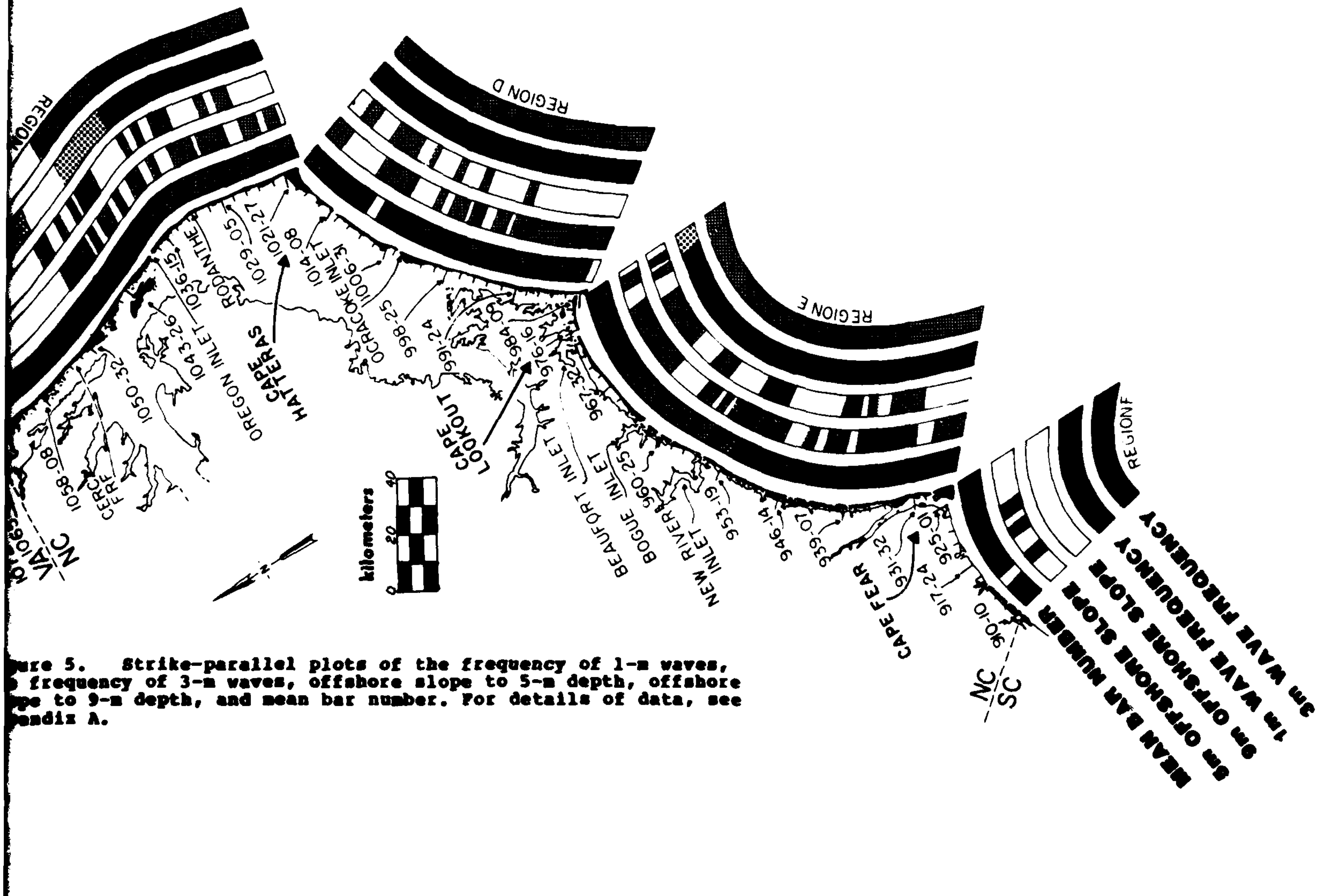
MD
CHINCOTEAGUE INLET
MD
VA
CHESAPEAKE BAY
VA
NC
REGION C



ure 5. Strike-parallel plots of the frequency of 1-m waves,
frequency of 3-m waves, offshore slope to 5-m depth, offshore
pe to 9-m depth, and mean bar number. For details of data, see
endix A.

2

Shoreline Strike

A wide range of coastal orientations occur in the study reach (Figure 2). The reach between Cape Henlopen and Ocean City Inlet is oriented dominantly north-south with a slight oceanward convexity. From Ocean City Inlet to the Chesapeake Bay the average orientation is north-northeast, but there are departures from this trend in the vicinity of inlets, particularly along the Virginia barriers. The reach between the Chesapeake Bay and Cape Hatteras strikes dominantly north-northwest, with an oceanward convexity occurring near Rodanthe, North Carolina, where the strike becomes more northerly. The arcuate reach between Cape Hatteras and Cape Lookout is oriented dominantly northeast, while the arcuate reach between Cape Lookout and Cape Fear strikes dominantly east-northeast. The remainder of the southern North Carolina coastline strikes generally east-west.

Dune Frequency

The frequency of dunes greater than 3 meters in elevation is an index of barrier island topography. Low-profile islands lack large dunes and are subject to island-wide inundation and modification during major overwash events. High-profile barriers have well-established dune lines (largely man-made) and are rarely overwashed to the lagoon side. Overwash on high-profile islands is limited to breaches in the dune line and the formation of small inter-dune washover fans. Low relief islands are subjected to periodic overwash over at least one half of the island width.

Between Cape Henlopen and the Maryland-Virginia border, high-profile barriers are dominant with the exception of small regions at Cape Henlopen and just south of Ocean City along northern Assateague Island (Figure 4). Between the Maryland-Virginia line and the Chesapeake Bay low-profile barriers characterize the Virginia coast. Fewer than 25% of the dunes along this reach are greater than 3 meters in elevation. The reach between the Chesapeake Bay and Cape Hatteras is dominantly a high-profile barrier coast with more than 75% of the dunes above 3 meters in most of the area. The only low-profile areas in this reach are just south of the Virginia border, near Oregon Inlet, and midway between Rodanthe and Cape Hatteras. Almost the entire coastal reach between Cape Hatteras and Cape Lookout is dominated by low-profile barriers with less than 25% of the dunes exceeding 3 meters in elevation. Between Cape Lookout and Cape Fear the coast is dominated by high-profile barrier islands where greater than 75% of the dunes are in excess of 3 meters in elevation. The southernmost reach of the study area between Cape Fear and the North Carolina-South Carolina border exhibits a highly variable topography, but tends toward a dominance of low-profile barriers.

Inlet Frequency

The spatial frequency of inlets is highly variable along the mid-Atlantic coast between Cape Henlopen and the North Carolina-South Carolina border (Figure 4). The northern reach between Cape Henlopen and Chincoteague Inlet and the central reach between the Chesapeake Bay and Cape Hatteras contain few inlets. The nearly 200 km of the coastline between Chesapeake Bay and Cape Hatteras has only one inlet, Oregon Inlet. Two segments of the coast are heavily dissected by inlets: 1) the Virginia barriers between Chincoteague Inlet and the Chesapeake Bay, and 2) the southernmost reach from New River Inlet to the South Carolina border. The reach between Cape Hatteras and New River Inlet has an intermediate frequency of inlets.

Overwash Penetration Distance (OPDX)

OPDX is not always a true measure of overwash penetration distance. For example, on high-relief barriers overwash penetration is limited by the dune barricade. In some cases on low-relief barriers, the entire barrier island is overwashed, hence, the OPDX value becomes equal to, and is dependent upon, island width. OPDX is essentially a measure of distance from the shoreline to the demarcation between active sand and well-established vegetation. Therefore, OPDX provides a good measure of overwash penetration distance for the last major overwash event on low-profile barriers that were not totally overwashed to the lagoon (provided there has not been total revegetation since the event). For low-profile barriers that are totally overwashed, OPDX is a conservative estimate of overwash distance. For high-profile barriers, overwash occurs only at inter-dune breaches. OPDX is mapped in Figure 3.

Rate of Shoreline Change (RSLX)

RSLX, the rate of shoreline change, is a sensitive measure of the dynamic sediment balance along the coast during the period of aerial photographic coverage. The majority of the mid-Atlantic barriers are experiencing net shoreline erosion (Figure 3). The highest rates of shoreline erosion occur along the Virginia barriers between Chincoteague Inlet and the Chesapeake Bay. Other local areas of high erosion include: 1) the northern fifth of Assateague Island (probably caused by blockage of southerly-drifting sand by engineering structures at Ocean City Inlet; 2) several zones of the North Carolina coast just south of the Virginia-North Carolina border; 3) the area near Oregon Inlet; 4) the area just north of the Carolina Capes: Hatteras, Lookout, and Fear; and 5) very localized areas on the up-drift sides of inlets. Areas of marked net accretion are few along the mid-Atlantic barriers. Rapidly-accreting areas are localized down-drift of inlet margins and on the down-littoral drift sides of some of the capes.

Tidal Range

Tidal range along the mid-Atlantic coast varies between 0.9 m and 1.6 m, therefore, the entire study area is classified as microtidal (Davies 1964). These tidal ranges are significantly higher than Gulf Coast tidal ranges which are typically less than 1 m. Tidal range is minimal near the center of the 800 km study reach (Figure 4), and fluctuates between 0.9 m and 1.1 m from the Chesapeake Bay to New River Inlet. Tidal range increases gradually to the north and south from the central region. To the north, tidal range peaks at 1.2 m and to the south it increases to 1.6 m at the North Carolina/South Carolina border.

Storm Surge

The storm surge values represent the maximum water levels produced by cyclonic activity with a recurrence interval of ten years. Storm surge in the northern half of the study area is caused principally by extratropical storms, while southern storm surge reflects the input of tropical cyclones and hurricanes. The pattern of storm surge variation closely correlates with the pattern of tidal range (Figure 4). With the exception of a 25-km reach bordering the Chesapeake Bay the storm surge is lowest along the central two-thirds of the study area and increases to the north and south. The maximum northern storm surge values reach 2 m along the Delaware coast.

South of Cape Lookout the storm surge values rise to 2.3 m near Cape Fear.

Sediment Size

Mean grain size of mid-Atlantic barrier beaches ranges from fine sand (2.75ϕ, 0.15 mm) to coarse sand (0.25ϕ, 0.84 mm). Sediment size is highly variable throughout the reach (Figure 4). This probably reflects a high degree of dependence on sediment heredity and local environmental hydrodynamics. Few spatially significant trends appear in the grain size data. A large area of anomalously fine sand occurs along the Virginia barriers and in scattered local areas along the reach south of Cape Lookout. Areas of anomalously coarse sand occur near Duck, between Rodanthe and Cape Hatteras, and near Cape Fear.

Offshore Slope

Offshore slope was measured from the shoreline to the 5.5-m water depth (3-fathom contour) and to the 9.1-m depth (5-fathom) contour. These measurements indicate that there is a large-scale spatial alternation of steep and gentle offshore slopes on a scale of 100 to 200 km along the mid-Atlantic coast (Figure 5). Offshore slope measured to the 5.5-m water depth varies from 0.93 m/km to 137.16 m/km in the study region. The reach between Cape Henlopen and the Maryland-Virginia border has relatively steep offshore slopes mostly in the range of 30 m/km to 40 m/km. Toward the southern end of this reach the values are in the 20 m/km to 30 m/km range. The Virginia barriers exhibit the most gentle offshore slopes in the study area, with slope values mostly in the range of 2 m/km to 6 m/km. The reach between the Chesapeake Bay and Cape Lookout is characterized by moderately gentle offshore slopes. There is a considerable degree of variation along this reach but most of the slope values are in the 11 m/km to 20 m/km range. South of Cape Lookout offshore slopes are moderately steep with values mostly in the range of 15 m/km to 30 m/km. Throughout the study area offshore slopes proximal to inlets are lower due to the effect of offshore ebb delta platforms.

A fairly good correlation exists between offshore slope, measured to the 9.1-m water depth, with that measured to the 5.5-m depth. The major deviations occur in magnitude of the slope variations along the coast. The Cape Henlopen to Maryland-Virginia line reach exhibits only moderately steep slopes to the 9.1-m contour, mostly in the range of 10 m/km to 20 m/km. Larger areas of the Chesapeake Bay to Cape Lookout reach are classified as having gentle offshore slopes with values between 5 m/km and 10 m/km when measured to the 9.1-m water depth.

Island Width

The width of mid-Atlantic barrier islands ranges from less than 0.5 km to 5 km with average widths between 1 km and 2 km (Figure 3). Island width is one of the most variable parameters observed along the coast and is affected by many factors such as: 1) proximity to inlets; 2) inheritance of earlier Holocene attached islands; 3) offshore slope; 4) overwash processes; and 5) inlet history. Islands north of Cape Hatteras are generally wider than those to the south. The widest islands are Assateague, several of the Virginia barriers, and the islands between the Virginia-North Carolina border and Oregon Inlet.

Lagoon Width

Lagoon width is also highly variable like island width and ranges from zero to 48.5 km (Figure 3). Areas lacking lagoons occur along two reaches of the Delaware coast, along the southern Virginia coast, and in localized areas of southern North Carolina. The Outer Banks between Oregon Inlet and Core Banks exhibit the widest lagoons exceeding 15 km. Areas of moderately wide lagoons (5 km to 15 km) occur along Assateague Island and along the North Carolina coast between the Virginia-North Carolina border and Oregon Inlet. Narrow lagoons (0.01 km to 5 km) occur along the Maryland-Delaware coast north of Ocean City, in southern Virginia, along southern Core Banks, and between Cape Lookout and the South Carolina border.

Wave Frequency

The frequency of waves greater than 1.5 m and greater than

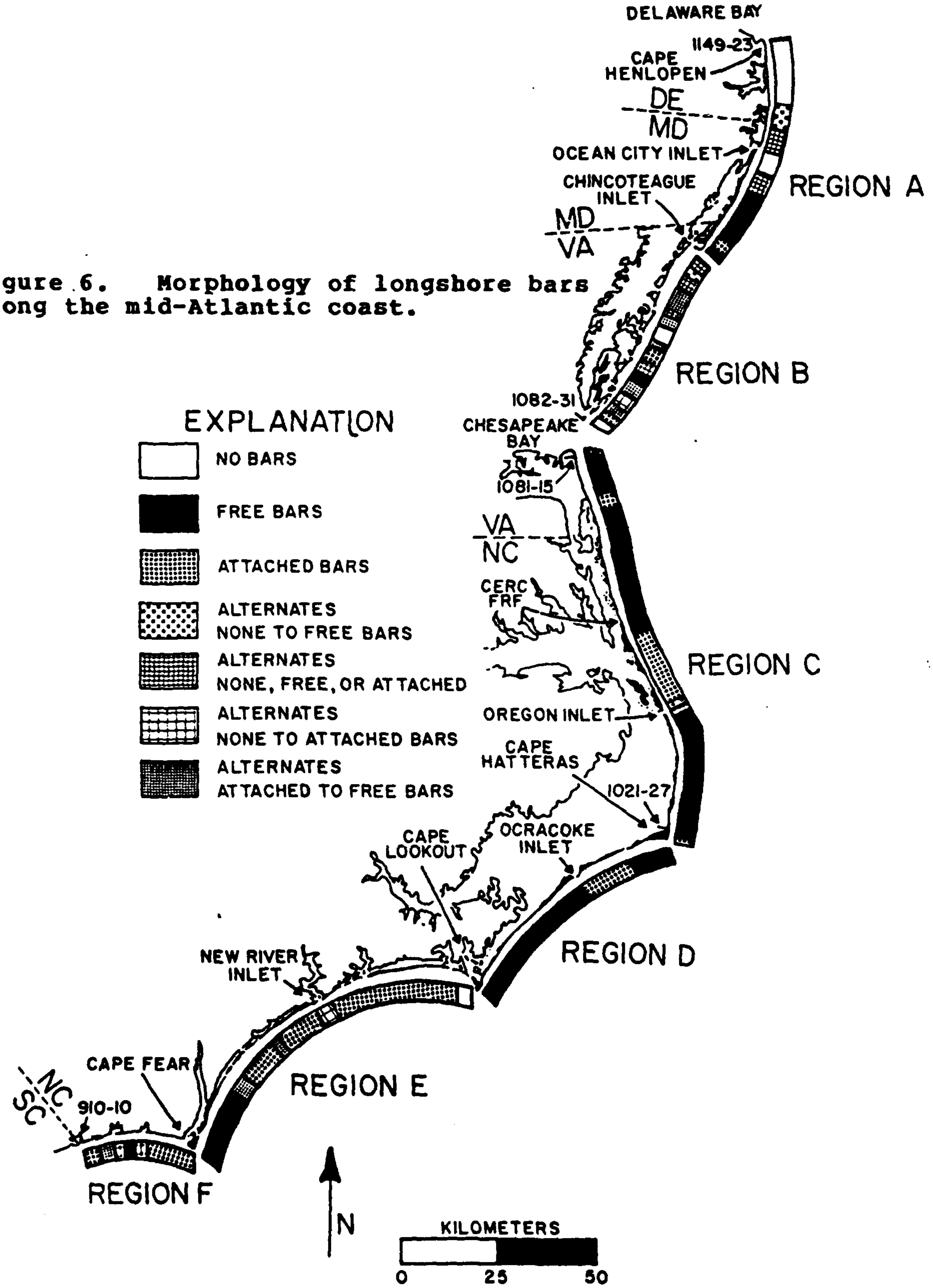
3.4 m are highly correlated (Figure 5). In general, the central part of the mid-Atlantic reach between the Maryland-Virginia border and Oregon Inlet has the lowest frequency of waves of both sizes. Wave frequency increases northward and southward, with a slight decrease in wave frequency over the southernmost 70 km of the study reach.

Mean Bar Number

Mean offshore bar number, based on aerial photograph observations, is highly variable in a spatial and temporal sense along the mid-Atlantic coast (Figure 5). General trends are apparent in bar configurations. Most of the Delaware coast is devoid of offshore bars in five sets of photographs examined. Most of the Maryland coast oscillates temporally between no bars and one bar. Over 50% of the Virginia coastline between the Maryland border and the Chesapeake Bay has a stable one-bar system, but there is considerable spatial variation between no bars and one bar along the Virginia barrier islands section. The reach with the most spatial and temporal variability in bar number is between the Chesapeake Bay and Rodanthe (Figure 5). Mean bar number varies between no bars and two bars in this area; few sections are temporally consistent between aerial photo sets. A nearly stable one-bar pattern exists in all photo sets examined from Rodanthe to the South Carolina border.

Bar morphologies were examined by observing attachment styles. Figure 6 illustrates the range of bar morphologies observed along the mid-Atlantic coast. The northern half of the Maryland coast is characterized by bar patterns that oscillate temporally between no bars, attached bars, and free (shore-parallel) bars. The southern two-thirds of Assateague Island is characterized by a free-bar system. Tremendous temporal and spatial variability in attachment styles characterize the Virginia barriers. The reach between the Chesapeake Bay and Duck, North Carolina, is characterized by a stable free-bar system. From Duck to Oregon Inlet and Cape Lookout a free-bar system predominates. The northern half of the arc between Cape Lookout and Cape Fear is characterized by attached bars, while the southern half has a free-bar system. Between Cape Fear and the North Carolina-South Carolina border an attached-bar system predominates.

Figure 6. Morphology of longshore bars along the mid-Atlantic coast.



DATA ANALYSIS

Table 4 summarizes the 15 parameters analyzed along the study reach, their definitions, and interpretations of negative and positive variations. Spatial relationships between the 15 parameters were recognized using two analytical techniques. First. the data set was analyzed by linear regression techniques using the Statistical Package for the Social Sciences program (SPSS) (Nie et al. 1975). The results of the regression analyses were combined with our understanding of process to establish a hierarchy of spatial relationships and trends visible along the study reach. The second mode of analysis was Principal Components Analysis (PCA). PCA was used to look for spatial organization and variations between the 15 parameters along the study reach. A summary of the results of each analysis is presented in the following sections.

During the initial analyses it became apparent that there were varying degrees of organization in the parameters depending on the spatial scales being observed. Therefore, analyses were run for the entire 800 km reach and also for selected regional data subsets. The study area was divided into six geographic subregions (Figure 2) according to geomorphic controls as follows: 1) Cape Henlopen to Chincoteague Inlet (115 km from transect 1149-23 to 1116-11); 2) the Virginia barriers between Chincoteague Inlet and the Chesapeake Bay (111 km from transect 1116-11 to 1078-13); 3) Chesapeake Bay to Cape Hatteras (195 km from transect 1077-19 to 1020-21); 4) Cape Hatteras to Cape

Lookout (122 km from transect 1019-34 to 983-21); 5) Cape Lookout to Cape Fear (190 km from transect 983-11 to 926-27); and 6) Cape Fear to the North Carolina-South Carolina border (56 km from 926-17 to 910-10). Base data entered into the analyses were originally on a 1 km spacing (see Appendix A).

Inlets and capes may notably skew data for many of the classification parameters in sample sites peripheral to these features. Our earlier studies of spatial variation in rates of shoreline change suggest that the along-the-coast extent of cape influence is about 4 km and the along-the-coast extent of inlet influence is less than 2 km (Vincent et al. 1976; Dolan et al. 1977). Therefore, each regression and principal components analysis was run for data sets including and excluding inlet and cape effects. Data sets excluding inlet and cape effects excluded samples within 2 km of inlets and within 4 km of capes.

Correlation Analysis

This section contains summaries of the significant correlations between the 15 classification parameters described in Table 4. Only correlations significant at the level of = 0.001 (99.99%) were accepted. Significant values of r were determined using the Test Statistic (T):

$$T = \frac{r \sqrt{n - 2}}{\sqrt{1 - r^2}}$$

Values for T were taken from the table in Kleinbaum and Kupper

(1978). Values of r = 0.35 were chosen as lower limits of acceptance as long as they were above the minimum calculated level of significance. Discussions of correlations are stratified as moderate (r between 0.35 and 0.59) and strong (r greater than 0.60). Only three data sets contained few enough cases to mandate using 0.60 as the minimally significant r value (see data sets REGBRM2, REGFWI, and REGFRM2) in Table 6.

Correlation analyses were used to answer a number of questions including: 1) What associations exist between variables and what dependencies are suggested by these associations? 2) Are the associations observed for the entire coast also observed when selected subregions are studied, i.e., are there different patterns and scales of organization between these variables along the coast? 3) Does the presence of capes and inlets affect the associations observed between variables? The correlation analysis does not tell us what variables are important in terms of classifying the coast because correlation analysis does not deal directly with the questions of how the relationships between the coastal parameters behave in a spatial manner or along the coast or what their relative magnitudes are in given regions. These latter questions will be addressed using Principal Components Analysis in a later section of this report.

Entire Coast - Cape Henlopen, Delaware, to North Carolina-South Carolina Border

In this data set 800 cases provided the base data at 1-km intervals from Cape Henlopen, Delaware, to the North

Carolina-South Carolina border. Five different correlations were run from this data set as follows: 1) BIGDAT - the entire coast at 1-km intervals, including areas peripheral to inlets and capes (n = 800); 2) INLETR2 - the entire coast at 1-km intervals, excluding areas peripheral to inlets and capes (n = 564); 3) SUBSET5 - the entire coast at 5-km intervals, including areas peripheral to inlets and capes (n = 160); 4) BIGDAT5 - the entire coast averaged over 5-km sections (n = 160); and 5) INLTRM5 - the entire coast averaged over 5-km sections, excluding areas peripheral to inlets and capes (n = 118). Significant moderate and strong correlations are summarized in Table 5.

The Entire Coast at 1-km Intervals (BIGDAT and INLETR2)

Correlation analysis of the 15 variables for the entire coast at 1-km intervals shows strong correlations between storm surge and tidal range and between shoreline strike and the frequency of waves greater than 1.5 m. Moderate correlations occur between the following variables: coastal strike, frequency of dunes higher than 3 m, spatial inlet frequency, overwash penetration distance, tidal range, storm surge, sediment size, offshore slope to the 5.5-m depth, offshore slope to the 9.1-m depth, island width, lagoon width, frequency of waves greater than 1.5-m high, frequency of waves greater than 3.4-m high, and mean bar number (see Table 5). Differences do occur in the numbers of significant correlations in data sets including sites adjacent to inlets and capes compared with data sets excluding

TABLE 5
SUMMARY OF SIGNIFICANT CORRELATIONS (n = 0.001 level)
CAPE HENLOPEN TO THE NORTH CAROLINA-SOUTH CAROLINA BORDER

Parameter+	BIGDAT	INLETR2	BIGDAT5	SUBSET5	INLTRM5
STRK	WFQ1(-.50) WFQ3(-.36)	WFQ1(-.61)* WFQ3(-.48)	DFQ3(+.39) WFQ1(-.52) WFQ3(-.37)	WFQ1(-.52) WFQ3(-.37)	DFQ3(+.38) WFQ1(-.63)* WFQ3(-.52)
DFQ3	OPDX(-.35)	OPDX(-.39)	OPDX(-.40) OFS5(+.40) OFS9(+.36) STRK(+.39)	OPDX(-.37)	OPDX(-.41) STRK(+.38)
INFQ	SEDS(-.43)	TDRG(+.37) STSG(+.41) SEDS(-.38)	SEDS(-.53) OFS9(-.40)	SEDS(-.42)	TDRG(+.39) STSG(+.45) SEDS(-.44)
OPDX	LAGW(+.35) DFQ3(-.35)	DFQ3(-.39)	LAGW(+.40) DFQ3(-.40)	DFQ3(-.37)	DFQ3(-.41)
RSLX					
TDRG	STSG(+.64)*	STSG(+.68)* INFQ(+.37)	STSG(+.65)*	STSG(+.61)*	STSG(+.69)* INFQ(+.39)
STSG	LAGW(-.40) TDRG(+.64)*	ISLW(-.35) LAGW(-.40) INFQ(+.41) TDRG(+.68)*	LAGW(-.41) TDRG(+.65)*	LAGW(-.41) TDRG(+.61)*	ISLW(-.43) LAGW(-.40) INFQ(+.45) TDRG(+.69)*
SEDS	INFQ(-.43)	INFQ(-.38)	LAGW(+.35) INFQ(-.53)	INFQ(-.42)	LAGW(+.35) INFQ(-.44)
OFS5	WFQ3(+.45)	WFQ3(+.47) BARS(-.44)	WFQ3(+.55) BARS(-.37) DFQ3(+.40)	WFQ3(+.37)	ISLW(-.36) WFQ3(+.53) BARS(-.53)
OFS9	WFQ3(+.41)	WFQ3(+.48)	WFQ3(+.53) DFQ3(+.36) INFQ(-.40)		WFQ3(+.55)
ISLW		WFQ1(-.45) WFQ3(-.36) STSG(-.35)			WFQ1(-.56) WFQ3(-.44) STSG(-.43) OFS5(-.36)
LAGW	OPDX(+.35) STSG(-.40)	STSG(-.40)	OPDX(+.40) STSG(-.41) SEDS(+.35)	STSG(-.41)	STSG(-.40) SEDS(+.35)
WFQ1	STRK(-.50)	STRK(-.61)* ISLW(-.45)	STRK(-.52)	STRK(-.52)	STRK(-.63 ISLW(-.56
WFQ3	STRK(-.36) OFS5(+.45) OFS9(+.41)	BARS(-.39) STRK(-.48) OFS5(+.47) OFS9(+.48) ISLW(-.36)	STRK(-.57) OFS5(+.55) OFS9(+.53)	STRK(-.37)	BARS(-.43 STRK(-.52 OFS5(+.53 OFS9(+.55 ISLW(-.44
BARS		OFS5(-.44) BARS(-.39)	OFS5(-.37)		OFS5(-.53 WFQ3(-.43

* denotes particularly strong correlations.

\+ for parameter definitions see Table 4.

these values.

Several correlations were common to both data sets which illustrates their persistence along the coast and independence from the effects of cape and inlet processes. The strongest correlation was between tidal range and storm surge. As tidal range increases storm surge also increases. The frequency of large waves approaching the coast is related to the strike of the coastline. As the coast strikes in a more easterly direction, the frequency of waves above 1.5 m and above 3.4 m decreases. Offshore slope also appears to directly affect the frequency of large waves (above 3.4 m) where large waves occur more frequently in areas of steeper offshore slope. Overwash penetration distance is controlled by island topography. As the frequency of dunes above 3 meters increases, OPDX decreases.

Additional correlations appear when the sites adjacent to inlets and capes are removed, thereby filtering out the direct effects of these features (data set INLETR2). Inlet frequency appears to be related to tidal range and storm surge. As the frequency of inlets along the coast increases, tidal range and storm surge increase. Island width decreases as storm surge increases. Mean bar number appears to be related to the frequency of large waves and to offshore slope. The number of bars decreases as offshore slope increases and as the frequency of waves greater than 3.4 m increases. These variables affecting mean bar number are masked in the vicinity of inlets due to the complex local hydrodynamics in these areas.

Persistence Analysis

The Entire Coast at 5-km Intervals (BIGDAT5)

At the outset of this study we decided that a 1-km sampling interval may be required to detect regional and local trends and organizational patterns in the study variables. BIGDAT5 represents a subset of the entire 800 case data set composed of every fifth case, hence this represents a sampling interval of 5 km along the coast. The relationships in the medium resolution sampling scheme of 5 km (BIGDAT5) are compared with high resolution sampling (1 km) shown in BIGDAT and INLETR2 (see table 5). In this manner, the persistence of the relationships can be tested for different sampling resolutions.

There is not a direct correspondence between trends visible in the two data sets. Over 75% of the same significant correlations occur in both (Table 5), but there are numerous strong relationships that occur in only one of the data sets. The following correlations occur solely in the INLETR2 data set: 1) as inlet frequency increases, tidal range and storm surge increase; 2) as storm surge increases, island width decreases; 3) as wave frequency increases, island width decreases; and 4) as wave frequency above 3.4 m increases, the mean number of bars increases. The correlations limited to the BIGDAT5 data set are: 1) as coastal strike becomes more easterly, the frequency of dunes above 3 m increases; 2) as dune frequency increases, offshore slope increases, 3) inlet frequency increases as offshore slope to the 9.1-m depth decreases; 4) as lagoon width increases, OPDX and sediment size also increase.

From this data it is unclear what the effects of different sampling resolutions are on the outcome of the correlations. The coarser sampling interval failed to pick up correlations with wave frequency and storm surge, which are relatively low resolution parameters. Therefore, a strong case is made for the use of the finer sampling interval, and the correlations obtained with the 1-km interval analysis are probably more reliable.

Entire Coast Averaged Over 5-km Segments (SUBSET5 and INLTRM5)

Considerable differences exist in the numbers of significant correlations between 5-km averages taken including sites adjacent to inlets and capes (SUBSET5) and 5-km averages with inlet and cape sites removed (Table 5). Correlations in SUBSET5 and BIGDAT are very similar. The only differences are that the BIGDAT data set shows a positive correlation between OPDX and lagoon width and a positive correlation between the frequency of large waves and offshore slope, while no significant correlations occurred between these variables when the entire coast is averaged over 5 km. The strong correspondence between SUBSET5 and BIGDAT and the weaker correspondence between BIGDAT5 and BIGDAT indicates that while a coarsening of sample interval from 1 km to 5 km results in a loss of information, a smoothing of the 1-km data by averaging over 5 km intervals does not significantly affect the results of the correlations. Likewise, there are very few differences in correlations between INLETR2 and INLTRM5, which suggests that a similar smoothing of high resolution sample data without inlet and cape sites can be done without disturbing the final relationships.

Effects of Inlets and Capes on Correlations

Removing the cases adjacent to inlets and capes does affect correlations in the 1-km and 5-km sampling schemes. The major effect of removing sites proximal to inlets and capes appears to be an increase in the value of the correlation coefficients observed in the original data sets. Of secondary importance, several new associations appeared that were not observed in the original data sets using all of the cases. Most of these new associations were apparent in the original data sets but their correlation coefficients were just below the 0.001 level of significance. Removing the cases adjacent to inlets and capes has removed a significant amount of noise from the system and allowed the associations to be more readily observed. The major new associations observed are the following: 1) positive correlations of inlet frequency with storm surge and tidal range; 2) negative correlation between island width and wave frequency, and 3) negative correlation between offshore slope and bar number.

Geographic Subregions at 1-km Sampling Intervals

Subsets of the 800-km data set were created in accordance with major geomorphic-geographic boundaries along the mid-Atlantic coast in order to determine if there was any significant organization between the various parameters on a regional scale that may be masked by analyses of the entire coast. Table 6 shows the significant correlations for the various geographic subregions. Table 6 clearly shows that greater numbers of significant correlations as well as correlations with higher r values occur for individual geographic subregions compared to the entire coast. This indicates that many of the relationships between parameters are organized on a region-specific scale that changes its overall pattern along the coast. In addition, there are differences in the degree of correlations between the various subregions. For example, subregion A between Cape Henlopen and Chincoteague Inlet has the highest number of correlations, while other subregions have fewer significant correlations. Therefore, subregion A appears to be structured in a more orderly fashion with respect to the variables studied. Subregion B shows the lowest number of associations between variables, suggesting that this is the least structured subregion along the entire mid-Atlantic coast.

Another general trend observed in the regional data sets is that subregions with consistent coastal strike tend to exhibit higher degrees of organization than regions with major shifts in orientation. This suggests that coastal strike is a major independent variable controlling the development of many of the other variables such as wave frequency, offshore slope, and storm surge. In general, the major trends observed in the entire coastal data sets become much less obvious in the subregional

TABLE 6
SUMMARY OF SIGNIFICANT CORRELATIONS (α = 0.001 level)
GEOGRAPHIC SUBREGIONS OF FIGURE 1

Parameter*	REGION A	REGION B	REGION C	REGION D	REGION E	REGION F
STRK	DFQ3(+.40) INFQ(+.48) OPDX(-.42) TDRG(+.72)* STSG(+.85)* OFS5(+.50) OFS9(+.41) ISLW(-.51) LAGW(-.55) BARS(-.66)*		TDRG(-.46) LAGW(-.84)* WFQ1(-.67)* WFQ3(-.67)*	DFQ3(+.71)* TDRG(-.53) STSG(-.83)* OFS9(-.65)* ISLW(+.43) LAGW(+.69)*	DFQ3(-.41) INFQ(-.34) OPDX(+.42) RSLX(+.36) STSG(-.93)* TDRG(-.73)* WFQ1(-.52) BARS(-.47)	INFQ(-.80)* OPDX(-.65)* TDRG(-.75)* STSG(+.91)* OFS5(-.74)* ISLW(-.65)*
DFQ3	OPDX(-.53) STSG(+.45) OFS5(+.51) OFS9(+.55) ISLW(-.42) LAGW(-.46) WFQ1(+.60)* WFQ3(+.56) BARS(-.51) STRK(+.40)			OPDX(-.37) STSG(-.65)* OFS9(+.44) ISLW(+.57) LAGW(+.49) STRK(+.71)*	OPDX(-.80)* OFS5(+.37) OFS9(+.39) ISLW(-.54) LAGW(-.55) WFQ1(+.59) WFQ3(+.47) BARS(+.57) STRK(-.41)	
INFQ	OPDX(-.52) TDRG(+.44) STSG(+.51) OFS5(+.56) ISLW(-.38) LAGW(-.65)* BARS(-.63)* STRK(+.48)		TDRG(-.43) STSG(+.62)* OFS5(+.40)		OFS9(-.39) STRK(-.34)	TDRG(+.75)* STSG(-.85)* BARS(-.62)*
OPDX	TDRG(-.41) STSG(-.46) OFS5(-.43) OFS9(-.37) LAGW(+.52) BARS(+.48) STRK(-.42) DFQ3(-.53) INFQ(-.52)		TDRG(+.57) STSG(-.35) OFS5(-.42)	SEDS(-.39) DFQ3(-.37)	OFS5(-.46) OFS9(-.43) ISLW(+.60)* LAGW(+.46) WFQ1(-.56) WFQ3(-.47) BARS(-.66)* STRK(+.42) DFQ3(-.80)*	STSG(-.65)* ISLW(+.99)* STRK(-.65)*
RSLX				ISLW(+.42)	BARS(-.46) STRK(+.36)	
TDRG	STSG(+.80)* OFS5(+.37) BARS(-.37) STRK(+.72)* INFQ(+.44) OPDX(-.41)	SEDS(-.62)* LAGW(+.78)*	OFS5(-.35) STRK(-.46) INFQ(-.43) OPDX(+.57)	STSG(+.82)* SEDS(-.31) OFS9(-.46) LAGW(-.44) BARS(-.56) STRK(-.53)	STSG(+.77)* ISLW(+.46) WFQ3(-.41) STRK(-.73)*	STSG(-.84)* BARS(-.60)* STRK(-.75)* INFQ(+.75)*
STSG	OFS5(+.63)* OFS9(+.40) ISLW(-.50) LAGW(-.55) BARS(-.72)* STRK(+.85)* DFQ3(+.45) INFQ(+.51) OPDX(-.46) TDRG(+.80)*		OFS5(+.57) BARS(-.35) INFQ(+.62)* OPDX(-.35)	SEDS(-.42) OFS9(-.65)* LAGW(-.62)* BARS(-.45) STRK(-.83)* DFQ3(-.65)* TDRG(+.82)*	SEDS(+.38) WFQ1(+.40) BARS(+.40) STRK(-.93)* TDRG(+.77)*	OFS9(-.70)* ISLW(-.65)* STRK(+.91)* INFQ(-.85)* OPDX(-.65)* TDRG(-.85)*
SEDS	BARS(-.39)	LAGW(-.62)* TDRG(-.62)*	LAGW(+.36)	OPDX(-.39) STSG(-.42)	STSG(+.38)	
OFS5	ISLW(-.56) LAGW(-.59) WFQ1(+.38) BARS(-.65)* STRK(+.51) DFQ3(+.51) INFQ(+.56) OPDX(-.43) TDRG(+.37) STSG(+.63)*	LAGW(-.63)*	INFQ(+.40) OPDX(-.42) TDRG(-.35) STSG(+.57)	LAGW(-.35)	ISLW(-.43) DFQ3(+.37) OPDX(-.46)	LAGW(-.73)*
OFS9	ISLW(-.41) LAGW(-.53) WFQ1(+.44) WFQ3(+.38) BARS(-.40) STRK(+.42) DFQ3(+.55) OPDX(-.37) STSG(+.39)		LAGW(+.35)	STRK(+.65)* DFQ3(+.44) TDRG(-.46) STSG(-.65)*	ISLW(-.45) WFQ3(+.37) BARS(+.40) DFQ3(+.39) INFQ(-.39) OPDX(-.43)	STRK(-.74)* STSG(-.70)*
ISLW	LAGW(+.46) WFQ1(-.50) WFQ3(-.42) BARS(+.53) STRK(-.51) DFQ3(-.42) INFQ(-.38) STSG(-.50) OFS5(-.56) OFS9(-.41)		WFQ1(-.42) WFQ3(-.37) BARS(+.45)	LAGW(+.45) STRK(+.43) DFQ3(+.49) RSLX(+.42)	LAGW(+.43) WFQ3(-.45) DFQ3(-.54) OPDX(+.60)* TDRG(+.48) OFS5(-.43) OFS9(-.45)	STRK(-.65)* OPDX(+.99)* STSG(-.65)*
LAGW	BARS(+.77)* STRK(-.55) DFQ3(-.46) INFQ(-.65)* OPDX(+.52) STSG(-.55) OFS5(-.59) OFS9(-.53) ISLW(+.46)	WFQ1(+.64)* WFQ3(+.64)* TDRG(+.78)* SEDS(-.62)* OFS5(-.63)*	WFQ1(+.78)* WFQ3(+.82)* STRK(-.84)* SEDS(+.36) OFS5(+.35)	STRK(+.69)* DFQ3(+.49) TDRG(-.44) STSG(-.62)* OFS5(-.35) ISLW(+.45)	WFQ1(-.77)* WFQ3(-.69)* DFQ3(-.55) OPDX(-.56) STSG(+.40)	OFS5(-.73)*
WFQ1	DFQ3(+.60)* OFS5(+.38) OFS9(+.44) ISLW(-.50)	LAGW(+.64)*	BARS(-.45) STRK(-.67)* ISLW(-.42) LAGW(+.78)*		BARS(+.35) STRK(-.52) DFQ3(+.59) OPDX(-.56) STSG(+.40) LAGW(-.77)*	
WFQ3	DFQ3(+.56) OFS9(+.38) ISLW(-.42)	LAGW(+.64)*	BARS(-.44) STRK(-.67)* ISLW(-.37) LAGW(+.82)*		DFQ3(+.47) OPDX(-.47) TDRG(-.41) OFS9(+.37) ISLW(-.45) LAGW(-.69)*	
BARS	STRK(-.66)* DFQ3(-.51) INFQ(-.63)* OPDX(+.48) TDRG(-.37) STSG(-.72)* SEDS(-.39) OFS5(-.65)* OFS9(-.40) ISLW(+.53) LAGW(+.77)*		STSG(-.35) ISLW(+.45) WFQ1(-.45) WFQ3(-.44)	TDRG(-.56) STSG(-.45)	STRK(-.47) DFQ3(+.57) OPDX(-.66)* RSLX(-.46) STSG(+.40) OFS9(+.40) WFQ1(+.35)	INFQ(-.62)* TDRG(-.60)*

* denotes particularly strong correlations
\+ For parameter definitions see Table [illegible]

data sets. For example, the negative correlation between inlet frequency and sediment size that was observed in all five of the entire coastal data set appears in only two of the six subregional data sets. Relationships between coastal strike and wave frequency are reversed from what was observed in the entire coastal data set.

A large number of new associations are observed in the subregional data sets that are not present in correlations of the entire coastal data sets. However, none of these trends appear in as many regions as the major trends first observed in analyses of the entire data set. hence, they appear to be specific to individual regions. New associations common to at least three of the six subregions include the following: 1) tidal range increases as coastal strike becomes more easterly; 2) storm surge increases as lagoon width decreases; 3) offshore slope increases as lagoon width decreases; 4) as island width decreases, the frequency of large dunes increases; and 5) as the frequency of large waves increases, the number of offshore bars decreases.

Subregion A - Cape Henlopen to Chincoteague Inlet

Table 6 shows that a great number of significant correlations occur in the region between Cape Henlopen and Chincoteague Inlet. Very minimal differences occur between the data set with inlets and capes compared to the one with these areas excluded. The only significant correlations in subregion A (REGARM) after inlet and cape areas were excluded were: 1) negative correlation between dune frequency and island width; 2) positive correlation between dune frequency and more easterly trending coastal strike; 3) negative correlation between OPDX and offshore slope to 9.1-m depth; 4) positive correlation between offshore slope to 5.5-m depth and tidal range; 5) negative correlation between sediment size and mean bar number; and 6) positive correlation between tidal range and offshore slope to the 5.5-m depth.

The strongest correlations will be summarized briefly. The moderate correlations are numerous and can be studied in Table 6. Coastal strike appears to be strongly related to tidal range, storm surge, and mean bar number. As the strike of the coast becomes more easterly, storm surge and tidal range increase while mean bar number tends to decrease. The frequency of dunes greater than 3-m high increases as the frequency of waves above 1.5 m increases. Inlet frequency is related to lagoon width and mean bar number such that inlet frequency increases as bar number decreases and as lagoon width decreases. Tide range and storm surge are highly correlated in a positive sense. Storm surge increases as offshore slope to the 5.5-m depth increases. The mean number of offshore bars appears to be controlled by coastal strike, inlet frequency, storm surge, and offshore slope. Significant correlations also occur between offshore bars and dune frequency, OPDX, tidal range, island width, and lagoon width. Mean bar number increases as coastal strike becomes more easterly, as dune frequency decreases, as inlet frequency decreases, as OPDX increases, as tidal range decreases, as storm surge decreases, as sediment size decreases, as offshore slope decreases, as island width increases, and as lagoon width increases.

Subregion B - Chincoteague Inlet to the Chesapeake Bay

Very few associations occur between variables along the Virginia barriers. The apparent lack of geomorphic organization within this subregion is most likely due to the high frequency of inlets and great local variance in shoreline orientation. The only moderate correlations are: 1) sediment size tends to increase as tidal range decreases and as lagoon width decreases; and 2) lagoon width tends to increase as offshore slope decreases, as sediment size decreases, as the frequency of large waves increases, and as tidal range increases.

Subregion C - Chesapeake Bay to Cape Hatteras

The strong associations are as follows: 1) as coastal strike becomes more northerly, lagoon width decreases and the frequency of large waves increases; and 2) storm surge increases as inlet frequency increases. A large number of moderate correlations occur along this reach of the coast and are summarized in Table 6.

Subregion D - Cape Hatteras to Cape Lookout

Strong correlations occur between the following variables in subregion D: 1) as coastal strike becomes more easterly, the frequency of large dunes increases, storm surge decreases, offshore slope decreases, and lagoon width increases; 2) as storm surge increases, the frequency of large dunes decreases, tidal range increases, lagoon width decreases, offshore slope decreases, and coastal strike becomes more northerly; and 3) as offshore slope increases, coastal strike becomes more easterly and storm surge decreases. A large number of significant moderate correlations occur along this reach of the coast and are summarized in Table 6.

Subregion E - Cape Lookout to Cape Fear

Strong correlations occur between the following variables in subregion E: 1) as coastal strike becomes more easterly, storm surge decreases and tidal range also decreases; 2) as the frequency of large dunes increases, the overwash penetration distance decreases; 3) overwash penetration distance increases as island width increases, as the frequency of large dunes decreases, and as the number of offshore bars decreases; 4) tidal range increases as storm surge increases; and 5) the frequency of large waves increases as lagoon width decreases. A large number of significant moderate correlations occur along this reach of the coast and are summarized in Table 6.

Subregion F - Cape Fear to the North Carolina-South Carolina Border

In region F only moderate correlations occur at the 0.001 level of significance due to the small data set after areas adjacent to inlets and capes were removed. The moderate correlations are: 1) as coastal strike becomes more easterly, inlet frequency decreases, overwash penetration distance decreases, tidal range decreases, storm surge increases, offshore slope decreases, and island width increases; 2) as inlet frequency increases, tidal range increases, storm surge decreases, and the number of offshore bars decreases; 3) overwash penetration distance increases as tidal range increases, as island width increases, and as the coastal strike becomes more northerly; 4) storm surge increases as offshore slope decreases, as island width decreases, as coastal strike becomes more easterly, as inlet frequency decreases, as overwash penetration distance decreases, and as tidal range decreases; 5) offshore slope increases as lagoon width decreases, as coastal strike becomes more northerly, and as storm surge decreases; and 6) the number of bars increases as inlet frequency decreases and as tidal range decreases.

Principal Components Analysis (PCA)

Principal components analysis is an analytical method applicable to large data matrices which transforms a series of correlated variables into a new set of statistically independent (orthogonal) factors called principal components or eigenvectors (Kleinbaum and Kupper 1978). The first eigenvector explains the largest amount of variance in the system while subsequent eigenvectors explain successively smaller amounts of the total variance. PCA also transforms original data scores into weightings (scores) where one unique set of scores occurs with each principal component (Daultrey 1976). This technique has been successful in explaining the variance in coastal geomorphology and beach systems (Vincent et al. 1975; Winant and Aubrey 1976; Resio et al. 1977, and Fisher et al. 1982) and is appropriate for the analysis of the 15 variables in this study listed in Table 4.

Principal components analysis was run for the entire data set (800 cases) at 1-km intervals and also for the various geographic subregions denoted in Figure 2. Only the runs where cases adjacent to inlets and capes were excluded will be discussed in this report.

Entire Coast from Cape Henlopen to the South Carolina-North Carolina Border

The data set excluding areas near capes and inlets includes 564 cases. The first four eigenvectors are statistically significant (according to Overland and Preisendorfer 1982). These four account for 63% of the total variance in the data.

Eigenvector 1 accounts for 23% of the variance alone. Figure 7 schematically depicts the results of the PCA interpreted with respect to the coastal geomorphology and processes. The schematic models shown in Figure 7 were constructed in the following manner. First, the basic model was developed using the weightings of the statistically significant eigenvectors. Second, the significant eigenvectors were reconstructed (merged) using a program that uses the mean, standard deviation, and weighting of each of the eigenvectors in accord with the following:

$$R_{ij} = \overline{X}_i(\pm c)\ (\sigma i)\ (\varepsilon_{ij}),$$

where R is the reconstructed value for the ith variable and the jth vector X_i is the mean for each variable, c is a constant, σi is the standard deviation of each variable, and ε_{ij} is the loading on each vector for each variable. For a detailed discussion of this technique see Resio et al. (1974). Analysis of the entire coastal data set is primarily sensitive to large-scale regional variations, while analysis of regional subsets is more likely to be depicting smaller-scale variations and organization in the data. Discussion of the results of PCA will proceed from north to south along the coast.

The northern reach of the mid-Atlantic barrier coast from Cape Henlopen to the southern part of Assateague Island, Virginia, is characterized by high-profile barriers (with the exception of northernmost Assatague Island) with very steep offshore slopes (the steepest slopes of the mid-Atlantic coast). Few inlets occur along this north to north-northeasterly striking coastline. Islands are variable in width but generally increase in width toward the south. Lagoon width also tends to increase from no lagoon in the north to wide lagoons in the south. The frequency of large waves is high along this reach while tidal range and storm surge are near the mean values for the mid-Atlantic coast. Sediments are coarse to moderately coarse and single bars predominate. Overwash penetration distance is about average and most of the region is experiencing slight net erosion.

Islands between southern Assateague Island and the Chesapeake Bay (Virginia barriers) have low profiles and very gentle offshore slopes. These islands strike dominantly north-northeast and are dissected by numerous inlets (the highest inlet frequency along the mid-Atlantic coast). The islands in the northern half of this reach are relatively wide while the southern islands are narrow. Lagoon width generally increases toward the south. The frequency of large waves is very low and tidal range and storm surge are near the regional mean for the entire coast. Sediments are moderately fine to fine and a single-bar system predominates. Overwash penetration distance is high and erosion rates are among the highest of the entire coast.

South from the Chesapeake Bay to the Kitty Hawk area of North Carolina (south of the CERC Pier), the barrier islands are generally high profile. Offshore slopes along this reach are moderately gentle in the north and become steeper southward. The strike of these islands is north-northwest throughout this reach and the area has no inlets. Islands are wide along this reach while lagoons are of average width. The frequency of large waves is very low. Storm surge is high along the northern half of the reach and low to the south. Tidal range is low at the north and increases to about the mean toward the south. Beach sediment size is variable along this reach but is generally coarse to the north and south and fine along the central portion of this reach. A two-bar system predominates offshore in most areas. Overwash penetration distance is low along the northern and southern thirds of this reach and high in the central portion of this slowly eroding reach of the coast.

Between the Kitty Hawk area and Cape Hatteras high-profile barriers are dominant except for the area bordering Oregon Inlet. Between Kitty Hawk and Rodanthe, the North Carolina coast strikes north-northwest. South of Rodanthe the coast strikes more northerly. Offshore slope along this reach is moderately steep to steep, except for a gentle reach near Oregon Inlet. Islands and lagoons are wide along the entire reach and only one inlet (Oregon Inlet) occurs in the area. The frequency of large waves is moderate near Oregon Inlet and increases toward Cape Hatteras. Storm surge values are near the mean and tidal range is low along this reach. Beach sediments are moderately coarse near Oregon Inlet and coarser toward Cape Hatteras. The dominant bar morphology is a two-bar pattern with small areas of alternating one-bar and two-bar systems. Overwash penetration distance is moderate to great along this reach and most of this coastline is experiencing moderately rapid erosion.

The region between Cape Hatteras and Cape Lookout is characterized by north-northeasterly to northeasterly striking islands of low profile. Offshore slope is moderately steep to moderate. The islands are wide along the northern half of the region and narrow to the south. and lagoons are wide throughout. Few inlets occur in this region, hence it has an inlet frequency near the mean. The frequency of large waves is high along this reach, storm surge is average, and tidal range increases from low to high southward along this reach. Sediments are variable along this reach, but are near the mean size for the mid-Atlantic barrier beaches. The northern half of the area is dominated by two bars while the southern half is dominated by alternating one-bar and two-bar systems. Overwash penetration distance is high along the entire area and rates of shoreline change are low.

From Cape Lookout south toward Cape Fear coastal strike progressively shifts from east-southeast to north-northeast. Most of the reach is dominated by high-profile barriers except for the northern segment between Beaufort Inlet and Cape Lookout and the southernmost segment between Fort Fisher and Cape Fear. This reach of the coast has a moderately steep offshore slope except for a gently-sloping area between Bogue Inlet and central Ashe Island. The islands are relatively narrow throughout this reach as are the lagoons, except for an area of wider lagoons north of Bogue Inlet. Few inlets occur along the northern half of this reach while many inlets occur along the southern half. Large waves are very frequent along most of this reach of the coast except for the northern and southern reaches where low waves predominate. Storm surge generally increases southward from a value near the study area mean in the north, while tidal range remains high throughout. From Cape Lookout to Bogue Inlet sediment size is variable but averages about the mean for the mid-Atlantic study region. Between Bogue Inlet and central Ashe Island sediments are fine. From central Ashe Island to New Topsail Inlet the sediments are coarse. From New Topsail Inlet to Fort Fisher beach sediments are fine. From Fort Fisher to Cape Fear sediments average about the mean. From Cape Lookout to Beaufort Inlet the bar pattern is one bar or no bars. The remainder of the reach is dominated by a one-bar system with occasional small areas of alternating one- and two-bar systems. Overwash penetration distance is low over most of the region except for the northern and southern ends. Most of this section of the coast is relatively stable or very slightly eroding.

Between Cape Fear and the South Carolina-North Carolina border the coast strikes easterly and has a moderate offshore slope. Island width and lagoon width are narrow along this reach that contains many inlets. The frequency of large waves is moderate, storm surge is high, and tidal range is the highest of any reach along the mid-Atlantic coast. Beach sediment size is variable but averages near the mean. The dominant bar pattern is a one-bar system. Overwash penetration is average and most of the coastline is stable or eroding at a slow rate.

Geographic Subregions

When Principal Components Analysis is run on smaller subregional data sets the degree of organization in the data structure seems to be greater. This is evidenced by the fact that the first four eigenvectors typically explain more than 70% of the variance in the subregional data sets compared to about 60% for the data set using the entire coastal reach. In addition, the first eigenvector typically accounts for about 40% of the variance for subregional data sets compared to values of about 20% for the entire coastal data set. In spite of the greater degree of organization evident at the local scale there are few significant differences with the models predicted by the analyses of the entire coastal data set for these subregions. Minor differences occur due to the greater resolution capabilities of the subregional analyses while some of these higher resolution changes may become masked by the entire coastal data set at the larger regional scale. We will address only those cases where significant differences are visible in the analyses of the subregional data at the local scale, and the discussion will proceed from north to south.

No significant differences occurred between Cape Henlopen and Chincoteague Inlet (subregion A). This suggests that the spatial variance in the coastal geomorphic and process parameters studied are organized on a sufficiently large scale to be extracted from analysis of the entire coastal data set. Between Chincoteague Inlet and middle Parramore Island (northern half of subregion B), the islands have a somewhat higher profile and lagoons are slightly wider than predicted from analyses of the entire coastal data set. The remainder of subregion B from Parramore Island to the Chesapeake is not significantly different from the model developed from the entire data set. In subregion C, between the Chesapeake Bay and Cape Hatteras, there are several areas where adjustments to the large-scale model are suggested from analyses of the subregions. In the reach between the Chesapeake Bay and False Cape, Virginia, the subregion data suggest there are fewer offshore bars and narrower islands. Between False Cape and the Virginia/North Carolina border the subregional data suggest higher profile islands, steeper offshore slopes, and slightly coarser sediments than indicated by the entire coastal data set.

Between Oregon Inlet and Rodanthe the subregional analysis suggests that a higher profile island is more characteristic, high waves are more frequent, slopes are slightly steeper, and the lagoons are even wider than indicated by the entire coastal data set. Between Rodanthe and Cape Hatteras the subregional analysis suggests that beach sediments are slightly finer, lagoons are wider, and fewer bars occur offshore than indicated by the entire coastal data set.

In subregion D, between Cape Hatteras and central Ocracoke Island, the islands have higher profiles, coarser sediments, and lower overwash penetration distance than indicated by the analyses of the entire coastal data set. In subregion E, the subregional analysis for the area between Cape Lookout and Beaufort Inlet suggests that higher waves occur and that the southern half of the Cape Lookout to Beaufort Inlet region has higher profile islands while the northern half has lower profile islands than indicated by the analysis of the entire coastal data set. Between Bogue Inlet and central Ashe Island the subregion data suggest that offshore slope is slightly steeper and that beach sediments are slightly coarser than indicated by the entire coastal data set. Between Fort Fisher and New Topsail Inlet the subregion model predicts that there are coarser sediments and a lower frequency of large waves than indicated by the model based on the entire coastal data set.

SUMMARY AND CLASSIFICATION

Coastal classification models have been proposed by numerous investigators over the past century. Most of these investigators attempted to develop a unified classification model to encompass coasts worldwide (Davis 1912, Johnson 1919, Cotton 1952, Valentin 1952, McGill 1958, Shepard 1963, Davies 1964, Inman and Nordstrom 1971, Dolan et al. 1972). Most of these models were based on the vertical or horizontal flux of the shoreline. Davis (1912) proposed a variation on his 'cycle of erosion' to include coastlines and their relation to uplift and erosion. The model proposed by Inman and Nordstrom (1971) is solely based on the tectonic environment of world coasts. Cotton (1952) made the first level of classification on tectonic bases and then subdivided these according to active geomorphic processes. Other classifications focused upon the relative balance between transgressive and regressive shorelines (Johnson 1919, Valentin 1952).

Some models placed the major emphasis on geomorphic processes important in the genesis of coastal sediments (Shepard 1963, Inman and Nordstrom 1971, Dolan et al. 1972). Davies (1964) classified coasts according to the marine process environment, that is, by wave and tidal regime. Kearns (1974) classified sandy, coastal-plain coasts according to: the presence of barrier islands, the vertical activity of the coastal region, horizontal shoreline dynamics, and relative sediment balance. These schemes have little regional or local applicability (i.e., for the mid-Atlantic coast) because they were designed to accommodate the varied tectonic and geomorphic environments of world coastlines, and, hence, they are overly general for high-resolution classification.

Several of the world classification schemes were based on regional observations and have a marked regional overprint. Tanner (1960) used observations of the Florida coast to develop a coastal classification based on the lateral stability of the shoreline. Price's (1959) model was based on observations made on Gulf of Mexico shorelines. It focuses on the role of marine processes in shaping coastlines and redistributing sediments.

No detailed classification models have been proposed for the mid-Atlantic barrier coast. In fact, few classification models focus on barrier coastlines. The regionalized classification models of Price (1959) and Tanner (1960), the hierarchical model of Dolan et al. (1972), and the sandy, coastal plain model of Kearns (1974) relate better to the mid-Atlantic coastline than the general world models, but still can not provide an effective system for classifying the geomorphic variations occurring along that coast.

The mid-Atlantic study reach is a microtidal, transgressive barrier coast with limited to moderate sediment supply. Analysis of 15 process and geomorphic variables (Table 4) provides the quantitative basis for a process-response model. Our plan was to divide the coast into broad regional compartments of similar geomorphic and process attributes. Figure 7 summarizes the results of the quantitative analyses (principal component analysis) with the 24 distinct coastal types recognized along the mid-Atlantic coast. It is important to note that the magnitudes of the variables are represented relative to the range of values occurring along the mid-Atlantic coast. and, therefore are not directly applicable to areas outside the 800-km study area. Many of the distinctions between high and low magnitude of the variables are necessarily small because of the geomorphic similarity within this microtidal study reach. Individual attributes display apparent spatial organization at various scales (See Figs. 3,4,5 and Tables 5,6), but little organization appears in the interrelationships between all of the parameters. Clearly, a unified classification must utilize fewer attributes if a smaller number of final classification categories is desired. The relationships between two or three variables exhibit greater organization (for example, see Resio et al. 1977, Vincent et al. 1976, Dolan et al. 1977. and Dolan et al. 1979).

By a first approximation, the mid-Atlantic coast can be divided into major geomorphic types based on large-scale morphology: 1) mainland coasts and attached barriers; 2) long, continuous barriers (greater than 25 km in length) with few inlets; and 3) short, discontinuous barriers with frequent inlets. Figure 7 illustrates the systematic recurrence of this morphologic sequence along the coast. Along the open coast

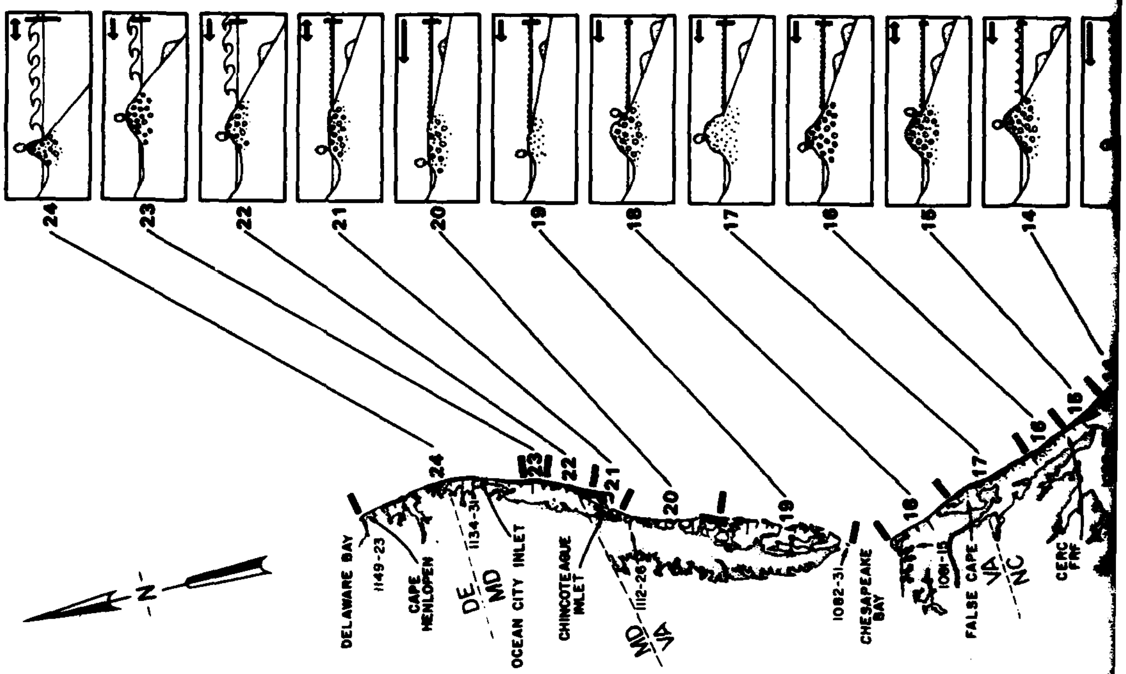
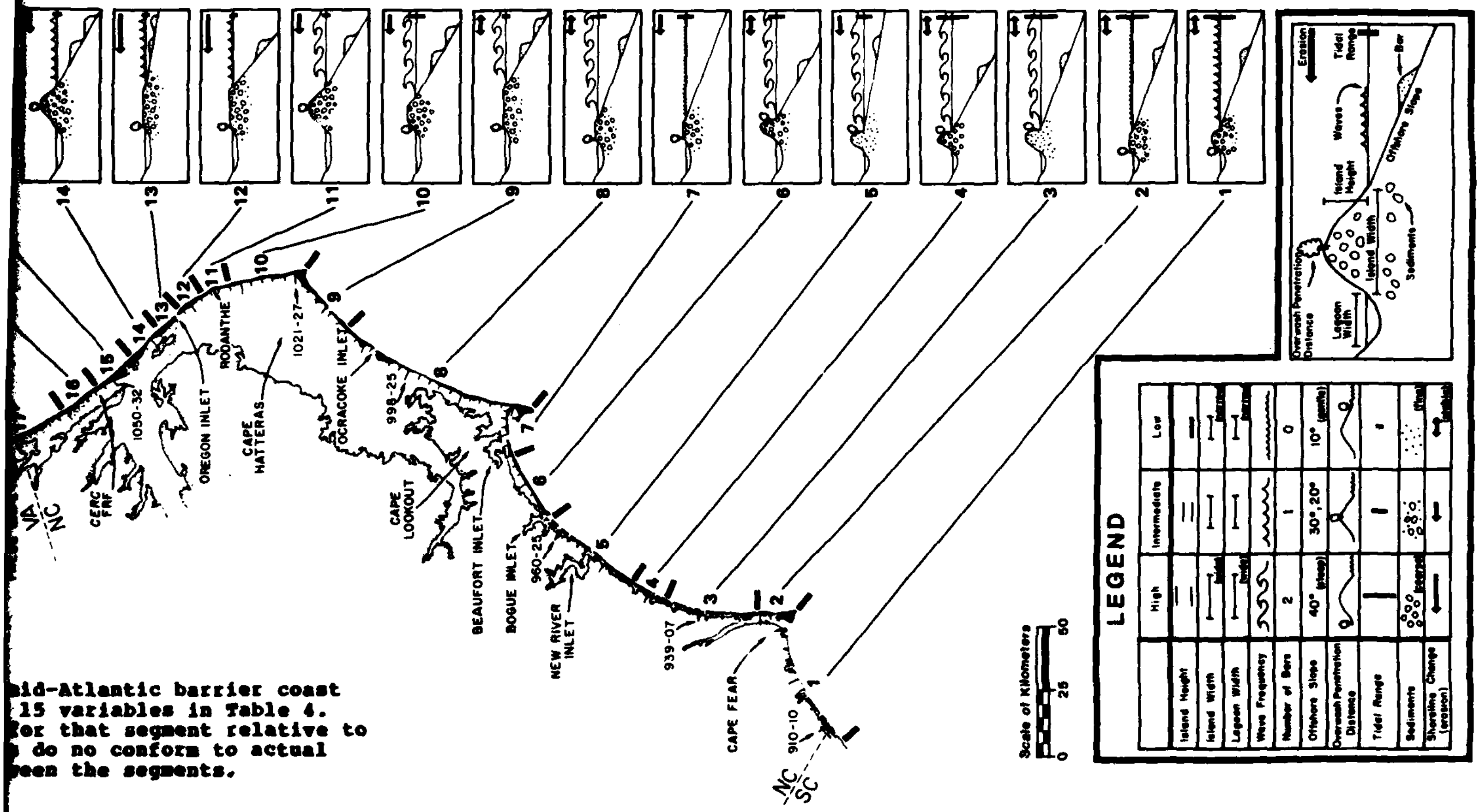


Figure 7. Schematic classification of the mid-Atlant
based on principal component analysis of the 15 variab
Each illustration represents the mean state for that s
the remainder of the coast. Although sketches do no co
scale, they do illustrate relative scale between the s



mid-Atlantic barrier coast
15 variables in Table 4.
for that segment relative to
do no conform to actual
een the segments.

1

2

immediately south of the Delaware Bay and the Chesapeake Bay, the barrier beaches are welded to the mainland (Fig. 7, segments 18 and 24). South of these areas, long, continuous barriers dominate the coastline (Fig. 7, segments 6-17 and 21-23). Finally, short, segmented barriers occur through the remainder of each reach (Fig. 7, segments 1-5 and 19-20). By deleting some of the variables from consideration (i.e., tidal range, storm surge, and overwash penetration distance) the coast can be subdivided into eight regions of similar geomorphic attributes. The first of these, the northernmost reach of the study area between Cape Henlopen and southern Assateague Island (Fig. 7, segments 22-24), is composed of mainland coast, attached barriers, and long barriers. This first segment is characterized by steep offshore slopes, coarse-grained sediments, zero or one offshore bar, high island profiles, high wave frequency, a slowly eroding coastline, and moderately wide lagoons and islands. The second geomorphic segment is between southern Assateague Island and the Chesapeake Bay (Fig. 7, segments 19-21). This region is characterized by short, discontinuous barriers, very gentle offshore slopes, fine-grained sediments, one bar, low island profiles, low wave frequency, rapidly-eroding coastlines, wide islands, and moderately-wide lagoons. The third geomorphic segment occupies the reach between the Chesapeake Bay and Nags Head (Fig. 7, segments 14-18). This segment begins at the north as a mainland-attached barrier beach and becomes a long, continuous barrier to the south. Geomorphic attributes of this segment include gentle to moderate offshore slopes, coarse- to medium-grained sediments. temporally variable one- or two-bar systems, high island profiles, low wave frequency, slowly-eroding coastlines, moderately-wide lagoons and wide islands. The fourth geomorphic segment of the study area lies between Nags Head and Rodanthe (Fig. 7, segments 11-13). This segment is characterized by long barriers with steep offshore slopes (except for the area near Oregon Inlet where slopes are gentle), moderately coarse-grained sediments, variable one- or two-bar systems, low island profiles, moderate wave frequency, rapidly-eroding coastlines, and wide islands and lagoons. The fifth geomorphic segment of the mid-Atlantic coast is a reach of long barriers between Rodanthe and Cape Lookout (Fig. 7, segments 8-10). This reach is characterized by moderate to steep offshore slopes, medium- to coarse-grained sediments, temporally variable one- or two-bar systems, low island profiles, high wave frequency, stable or slowly-eroding coastlines, moderate to wide islands, and wide lagoons. The sixth geomorphic reach of the mid-Atlantic coast is between Cape Lookout and Beaufort Inlet and is the small area sheltered from wave activity by Cape Lookout (Fig. 7, segment 7). This reach is characterized by moderately-gentle offshore slopes, medium-grained sediments, no bars, low island profiles, low wave frequency, slowly-eroding coastlines, and moderately-wide lagoons and islands. The seventh geomorphic segment of the profile islands. Following stabilization, island-wide overwash ceased, islands became high profile barriers, and beaches narrowed and steepened (Dolan 1972). Coastal engineering and shore protection projects have altered sediment transport along the barrier beaches in other ways. In particular, sand entrapment structures such as jetties and groins can cause serious depletion of longshore sand supply to downdrift beaches (for example, see Ocean City Inlet jetties). Beach nourishment projects provide excess sand to selected beaches. In these ways, man's activities on barrier islands can significantly alter natural rates of shoreline erosion and accretion. Therefore, it is becoming increasingly difficult along populated beaches, such as the mid-Atlantic barriers, to separate natural response from man-induced response. This rapidly adds complexity to classification schemes.

Our data from the microtidal mid-Atlantic beaches should provide a solid data base for local and regional surveys and coastal zone planning along the study reach. In addition, it should serve as a good basis for future classifications schemes in other environments of varied tidal energy, wave climate, and tectonic settings; as well as for comparative studies of other microtidal coastlines.

mid-Atlantic coast is the reach between Beaufort Inlet and Mason Inlet (Fig. 7, segments 3-6). The northern part of this reach is characterized by long barriers, while the southern part is composed of short barriers with frequent inlets. The seventh segment is characterized by moderately-steep offshore slopes (except segment 5 on Fig. 7), variable sediment size, one offshore bar, high island profiles, high wave frequency, stable coastlines, and narrow lagoons and islands. The eighth, and southernmost, geomorphic segment in the study area occurs between Mason Inlet and the North Carolina - South Carolina border. This segment is characterized by short barriers, moderate offshore slopes, one offshore bar, medium-grained sediments, low island profiles, low wave frequency, stable coastlines, and narrow lagoons and islands.

We have been able to categorize the coast into a small number of similar geomorphic reaches by using subsets of the data base, however, when all fifteen parameters are used, the number of geomorphic classes increases to twenty-four. Our analyses have delineated several reasons why our attempts to develop a simple classification with fewer than eight classes have failed. First, there does not appear to be a clear coupling of process and response variables. In many geomorphic systems this problem of equifinality in determining the geomorphic product is quite common, that is, there are many process routes to the same morphometric form (response). Our data are capable of delineating response on a 1-km resolution but can not designate direct associations with process (particularly on the same scales).

A second problem with classifying the coast is the disparity in resolution scale between process and geomorphic response variables. In order to explain the high-resolution variations in geomorphic variables measured from maps and aerial photographs, process variables must be measured on a much higher resolution scale than was done in this study. Such data would require a large investment in resources, well beyond the scope of our study, where process and response variables could be measured at similar scales.

Third, a major cause of difficulty in establishing a process-response classification is the inability to distinguish between morphometric features caused by modern processes vs. those associated with relict processes. For example, offshore slope, island width, lagoon width, and sediment size, are probably associated with relict phenomena. On the other hand, overwash penetration distance, the rate of shoreline change, and bar number probably are in local equilibrium with modern processes.

Fourth, man's interference with, and manipulation of, natural barrier island processes also has had considerable impact on island morphology. Among the most notable of man's efforts to change barrier morphology are the massive dune stabilization projects of the past 50 years. Prior to dune stabilization, many areas of the mid-Atlantic barriers were low profile islands. Following stabilization, island-wide overwash ceased, islands became high profile barriers, and beaches narrowed and steepened (Dolan 1972). Coastal engineering and shore protection projects have altered sediment transport along the barrier beaches in other ways. In particular, sand entrapment structures such as jetties and groins can cause serious depletion of longshore sand supply to downdrift beaches (for example, see Ocean City Inlet jetties). Beach nourishment projects provide excess sand to selected beaches. In these ways, man's activities on barrier islands can significantly alter natural rates of shoreline erosion and accretion. Therefore, it is becoming increasingly difficult along populated beaches, such as the mid-Atlantic barriers, to separate natural response from man-induced response. This rapidly adds complexity to classification schemes.

Our data from the microtidal mid-Atlantic beaches should provide a solid data base for local and regional surveys and coastal zone planning along the study reach. In addition, it should serve as a good basis for future classifications schemes in other environments of varied tidal energy, wave climate, and tectonic settings; as well as for comparative studies of other microtidal coastlines.

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APPENDIX A

Appendix A

	TRANSECT	STRK	DFQ3	INPQ	OPDX	RSLX	TDRG	STSG	SEDS	OFS5	OFS9	ISLW	LAGW	WFQ1	WFQ3	BARS
1	910-10	59.	5.	3.	137.10	6.10	1.60	2.00	.19	4.90	2.79	1.37	1.83	29.10	1.90	1.00
2	910-20	59.	5.	3.	72.60	3.50	1.60	2.00	.19	5.72	2.72	.73	1.65	29.10	1.90	1.00
3	910-30	63.	2.	3.	122.00	3.60	1.60	2.00	.19	9.80	3.01	1.22	1.73	29.10	1.90	1.00
4	911- 7	64.	7.	3.	156.90	2.90	1.60	2.00	.21	11.43	3.46	1.57	.91	29.10	1.90	1.00
5	911-17	74.	5.	4.	75.90	1.70	1.60	2.00	.21	8.57	4.08	.76	.46	29.10	1.90	1.00
6	911-27	75.	3.	4.	138.40	2.40	1.60	2.00	.18	6.23	5.20	1.38	1.46	29 10	1.90	1.00
7	912- 4	71.	0.	3.	101.90	-.50	1.60	2.00	.23	6.86	5.44	1.02	1.37	29.10	1.90	1.00
8	912-14	65.	9.	3.	72.60	-1.10	1.60	2.00	.23	8.57	5.44	.73	1.05	29.10	1.90	1.00
9	912-24	68.	10.	3.	69.70	-.10	1.60	2.00	.28	11.43	5.20	.70	.82	29.10	1.90	1.00
10	912-34	71.	9.	3.	78.70	.20	1.60	2.00	.28	11.43	5.44	.79	.79	29.10	1.90	1.00
11	913-12	74.	10.	3.	104.80	.20	1.60	2.00	.28	11.43	5.44	1.05	.12	29.10	1.90	0.00
12	913-22	73.	9.	3.	62.90	0.00	1.60	2.10	.20	11.43	5.44	.63	.13	29.10	1.90	0.00
13	913-32	73.	8.	3.	65.50	0.00	1.60	2.10	.20	11.43	5.72	.66	.10	29.10	1.90	0.00
14	914- 8	74.	6.	3.	68.80	.30	1.60	2.10	.21	13.72	5.72	.69	.12	29.10	1.90	0.00
15	914-18	79.	5.	2.	43.60	0.00	1.60	2.10	.25	9.80	5.44	.44	.11	29.10	1.90	0.00
16	914-28	70.	4.	2.	56.20	-1.10	1.60	2.10	.25	5.28	5.44	.56	.39	29.10	1.90	1.00
17	915- 5	72.	2.	2.	163.40	-4.20	1.60	2.10	.27	4.90	4.97	1.63	.61	29.10	1.90	1.00
18	915-15	87.	3.	3.	95.40	.30	1.60	2.10	.24	7.62	4.97	.95	.15	29.10	1.90	1.00
19	915-25	74.	7.	2.	50.40	.10	1.60	2.10	.24	11.43	4.97	.50	0.00	29.10	1.90	1.00
20	915-35	82.	5.	2.	28.90	-.70	1.60	2.10	.24	11.43	4.76	.29	0.00	29.10	1.90	1.00
21	916-10	82.	4.	2.	42.60	-.70	1.60	2.10	.24	11.43	4.40	.43	0.00	29.10	1.90	1.00
22	916-20	83.	4.	2.	44.30	-.50	1.60	2.10	.26	9.80	3.57	.44	0.00	29.10	1.90	1.00
23	916-30	84.	4.	2.	49.10	-.20	1.50	2.20	.29	11.43	3.81	.49	0.00	29.10	1.90	1.00
24	917- 4	83.	4.	2.	54.80	-.70	1.50	2.20	.29	13.72	3.36	.55	0.00	29.10	1.90	1.00
25	917-14	85.	5.	2.	32.90	-.70	1.50	2.20	.22	11.43	4.97	.33	0.00	29.10	1.90	1.00
26	917-24	85.	5.	2.	30.30	-.40	1.50	2.20	.22	11.43	6.02	.30	0.00	29.10	1.90	1.00
27	917-34	85.	6.	2.	29.10	-.30	1.50	2.20	.28	11.43	6.02	.29	0.00	29.10	1.90	1.00
28	918-10	87.	8.	2.	24.80	-.50	1.50	2.20	.40	11.43	5.44	.25	0.00	29.10	1.90	1.00
29	918-20	91.	7.	1.	27.80	-1.10	1.50	2.20	.40	9.80	4.57	.28	0.00	29.10	1.90	1.00
30	918-30	75.	4.	1.	97.70	-2.70	1.50	2.20	.21	4.90	4.23	.98	.76	29.10	1.90	1.00
31	919- 9	101.	3.	1.	59.60	-2.10	1.50	2.20	.27	8.57	5.44	.60	1.46	29.10	1.90	1.00
32	919-19	85.	6.	1.	23.10	.10	1.50	2.20	.27	11.43	3.09	.23	1.02	29.10	1.90	1.00
33	919-29	85.	6.	1.	29.20	-.40	1.50	2.20	.28	13.72	3.81	.29	0.00	29.10	1.90	1.00
34	920- 7	88.	7.	1.	40.50	-.40	1.50	2.20	.28	13.72	3.36	.41	0.00	29.10	1.90	1.00
35	920-17	89.	5.	1.	89.00	-.30	1.50	2.20	.33	13.72	3.81	.89	0.00	29.10	1.90	1.00
36	920-27	89.	4.	1.	96.90	-.40	1.50	2.20	.36	13.72	4.76	.97	0.00	29.10	1.90	1.00
37	921- 2	92.	4.	1.	73.10	-.40	1.50	2.20	.37	17.15	5.20	.73	0.00	29.10	1.90	1.00
38	921-12	94.	4.	2.	66.40	-.40	1.50	2.20	.37	17.15	5.44	.66	0.00	29.10	1.90	1.00
39	921-22	96.	4.	2.	42.00	-.20	1.50	2.20	.23	13.72	4.97	.42	0.00	29.10	1.90	1.00
40	921-32	97.	4.	2.	26.00	-.50	1.50	2.20	.29	17.15	4.76	.26	0.00	29.10	1.90	1.00
41	922- 7	97.	5.	2.	20.60	-.70	1.50	2.20	.29	11.43	4.23	.21	0.00	29.10	1.90	1.00
42	922-17	102.	5.	2.	17.80	-.70	1.50	2.20	.26	11.43	4.08	.18	0.00	29.10	1.90	1.00
43	922-27	103.	5.	1.	16.40	-.80	1.50	2.30	.26	9.80	3.69	.16	0.00	29.10	1.90	1.00
44	923- 2	104.	4.	1.	15.30	-.80	1.50	2.30	.23	8.57	3.18	.15	0.00	29.10	1.90	1.00
45	923-12	105.	5.	1.	9.10	-1.50	1.50	2.30	.35	5.72	2.86	.09	0.00	29.10	1.90	1.00
46	923-22	107.	6.	1.	12.20	-1.70	1.50	2.30	.35	4.90	2.54	.12	0.00	29.10	1.90	1.00
47	923-32	107.	6.	1.	19.90	-1.10	1.50	2.30	.30	3.43	1.87	.20	.94	29.10	1.90	1.00
48	924- 7	108.	8.	1.	41.40	0.00	1.50	2.30	.26	2.54	1.66	.41	1.46	29.10	1.90	1.00
49	924-17	103.	8.	1.	20.50	.70	1.50	2.30	.26	1.52	1.52	.21	2.01	29.10	1.90	1.00
50	924-27	108.	8.	1.	30.00	-.20	1.50	2.30	.35	1.27	1.43	.30	2.29	29.10	1.90	1.00

	TRANSECT	STRK	DFQ3	INPQ	OPDX	RSLX	TDRG	STSG	SEDS	OFS5	OFS9	ISLW	LAGW	WFQ1	WFQ3	BARS
51	925- 1	96.	4.	1.	67.10	6.00	1.50	2.30	.35	1.25	1.45	.67	3.54	29.10	1.90	.50
52	925-11	142.	3.	1.	162.80	11.70	1.40	2.30	.35	2.86	2.08	1.63	18.78	29.10	1.90	.50
53	925-21	116.	10.	1.	65.70	1.10	1.40	2.30	.35	3.81	2.66	.66	17.83	29.10	1.90	.50
54	925-31	110.	10.	1.	63.20	-.30	1.40	2.30	.35	3.81	2.33	.63	11.34	29.10	1.90	.50
55	926- 7	116.	10.	2.	58.20	-.60	1.40	2.30	.35	2.98	2.29	.58	2.62	26.00	1.80	.50
56	926-17	121.	10.	2.	51.40	-1.60	1.40	2.30	.35	2.64	1.94	.51	3.90	26.00	1.80	.50
57	926-27	108.	3.	2.	70.90	-8.50	1.40	2.30	.35	1.20	1.36	.71	0.00	26.00	1.80	.50
58	927-11	351.	2.	2.	72.30	1.00	1.40	2.30	.35	11.43	2.93	.72	0.00	26.00	1.80	.50
59	927-21	355.	8.	2.	49.20	2.90	1.40	2.30	.35	6.23	2.79	.49	0.00	26.00	1.80	1.00
60	927-31	4.	9.	2.	73.20	-1.00	1.40	2.30	.35	5.28	2.72	.73	0.00	27.90	1.80	1.00
61	928- 6	7.	10.	2.	72.20	-1.10	1.40	2.30	.35	9.80	2.48	.72	7.47	27.90	1.80	1.00
62	928-16	9.	9.	2.	115.10	-2.20	1.40	2.30	.35	7.62	3.94	1.15	6.78	27.90	1.80	1.00
63	928-26	10.	5.	2.	179.30	-1.00	1.40	2.30	.35	11.43	4.23	1.79	6.49	27.90	1.80	1.00
64	929- 2	14.	3.	2.	135.00	-1.00	1.40	2.30	.35	6.23	4.23	1.35	5.79	27.90	1.80	1.00
65	929-12	18.	10.	2.	125.40	-.40	1.30	2.30	.35	6.23	4.08	1.25	5.27	27.90	1.80	1.00
66	929-22	17.	2.	1.	146.10	-4.00	1.30	2.30	.35	8.57	3.57	1.46	4.78	27.90	1.80	1.00
67	929-32	28.	5.	1.	218.80	.90	1.30	2.30	.35	22.86	4.76	2.19	4.70	27.90	1.80	1.00
68	930- 7	21.	3.	1.	182.50	3.10	1.30	2.30	.35	9.80	3.69	1.83	4.65	27.90	1.80	1.00
69	930-17	23.	0.	1.	87.50	1.90	1.30	2.30	.35	9.80	3.69	.88	4.96	27.90	1.80	1.00
70	930-27	24.	6.	1.	97.00	-.70	1.30	2.30	.35	6.23	4.23	.97	5.08	27.90	1.80	1.00
71	931- 2	20.	3.	1.	130.30	-2.50	1.30	2.30	.35	4.90	4.76	1.30	3.52	27.90	1.80	1.00
72	931-12	16.	7.	1.	84.80	-3.70	1.30	2.30	.35	8.57	5.20	.85	3.84	27.90	1.80	1.00
73	931-22	27.	9.	1.	34.20	-2.70	1.30	2.30	.35	17.15	6.72	.34	3.51	27.90	1.80	1.00
74	931-32	16.	10.	2.	44.20	-.90	1.30	2.30	.40	22.86	9.53	.44	3.61	27.90	1.80	1.00
75	932- 7	15.	10.	2.	29.10	-1.00	1.20	2.30	.40	22.86	9.53	.29	3.11	27.90	1.80	1.00
76	932-17	17.	10.	2.	32.10	-1.00	1.20	2.30	.26	17.15	7.62	.32	3.41	27.90	1.80	1.00
77	932-27	20.	10.	2.	33.30	-1.10	1.20	2.30	.26	22.86	16.33	.33	3.35	27.90	1.80	1.00
78	933- 2	17.	10.	2.	31.70	-1.10	1.20	2.30	.25	22.86	7.14	.32	2.50	27.90	1.80	1.00
79	933-12	20.	10.	2.	28.50	-.20	1.20	2.30	.25	22.86	11.43	.29	2.44	27.90	1.80	1.00
80	933-22	18.	10.	1.	30.50	.40	1.20	2.30	.56	17.15	8.16	.31	2.32	30.20	2.50	1.00
81	933-32	20.	10.	1.	34.40	.10	1.20	2.20	.56	34.29	16.33	.34	2.09	30.20	2.50	1.00
82	934- 7	21.	10.	1.	33.00	-.40	1.20	2.20	.42	17.15	14.29	.33	.16	30.20	2.50	1.00
83	934-17	18.	5.	1.	68.00	-1.10	1.20	2.20	.42	13.72	6.72	.68	.82	30.20	2.50	1.00
84	934-27	20.	2.	1.	59.40	-5.10	1.20	2.20	.24	11.43	8.79	.59	.85	30.20	2.50	1.00
85	935- 3	22.	8.	1.	67.50	-3.90	1.20	2.20	.24	13.72	12.70	.68	2.74	32.30	2.70	1.00
86	935-13	23.	1.	1.	66.40	-7.80	1.20	2.20	.24	17.15	14.29	.66	.98	32.30	2.70	1.00
87	935-23	23.	6.	2.	60.20	-2.60	1.20	2.20	.24	22.86	9.53	.60	1.65	32.30	2.70	1.00
88	935-33	22.	8.	2.	53.70	-2.30	1.20	2.20	.24	17.15	9.53	.54	1.60	32.30	2.70	1.00
89	936- 9	22.	7.	2.	64.50	-1.80	1.20	2.20	.24	13.72	12.70	.65	1.82	32.30	2.70	1.00
90	936-19	23.	10.	2.	47.50	-1.90	1.20	2.20	.24	17.15	9.53	.48	1.58	32.30	2.70	1.00
91	936-29	22.	9.	2.	45.30	-1.20	1.20	2.20	.24	17.15	12.70	.45	1.65	32.30	2.70	1.00
92	937- 5	20.	3.	2.	63.90	-1.30	1.20	2.10	.24	17.15	12.70	.64	1.65	32.30	2.70	1.00
93	937-15	20.	10.	2.	41.30	-1.40	1.20	2.10	.24	17.15	12.70	.41	1.85	32.30	2.70	1.00
94	937-25	23.	7.	3.	50.20	-1.40	1.20	2.10	.24	13.72	12.70	.50	1.55	32.30	2.70	1.00
95	937-35	22.	8.	3.	51.50	-2.10	1.20	2.10	.24	17.15	10.39	.52	1.37	32.30	2.70	1.00
96	938-11	28.	3.	3.	63.30	-3.70	1.20	2.10	.24	11.43	6.35	.63	1.10	32.30	2.70	1.00
97	938-21	37.	2.	3.	158.40	-4.20	1.20	2.10	.24	7.62	7.62	1.58	1.60	32.30	2.70	1.00
98	938-31	43.	4.	2.	340.90	-3.10	1.20	2.10	.24	4.03	5.72	3.41	1.30	32.30	2.70	1.00
99	939- 7	34.	3.	2.	60.60	2.70	1.20	2.10	.24	11.43	10.39	-.02	1.45	32.30	2.70	1.00
100	939-17	31.	10.	2.	52.70	1.50	1.20	2.10	.24	13.72	8.79	.53	1.05	32.30	2.70	1.00

	TRANSECT	STRK	DFQ3	INFQ	OPDX	RSLX	TDRG	STSG	SEDS	OFS5	OFS9	ISLW	LAGW	WFQ1	WFQ3	BARS
101	939-27	35.	10.	2.	54.80	1.00	1.20	2.10	.42	13.72	8.79	.55	1.96	32.30	2.70	1.00
102	940- 3	32.	10.	3.	53.00	.80	1.20	2.10	.69	9.80	10.39	.53	1.77	32.30	2.70	1.00
103	940-13	27.	7.	3.	82.70	.30	1.20	2.10	.26	11.43	9.53	.83	1.77	32.30	2.70	1.00
104	940-23	27.	10.	3.	61.40	.40	1.20	2.10	.26	13.72	10.39	.61	1.71	32.30	2.70	1.00
105	940-33	30.	10.	3.	70.90	1.00	1.20	2.10	.26	13.72	9.53	.71	1.62	32.30	2.70	1.00
106	941- 8	38.	7.	3.	86.90	-2.00	1.20	2.10	.26	13.72	8.79	.87	1.28	32.30	2.70	1.00
107	941-18	32.	0.	4.	49.50	1.00	1.20	2.10	.22	11.43	8.16	.50	1.41	32.30	2.70	1.00
108	941-28	36.	2.	4.	72.00	-.60	1.20	2.10	.22	13.72	10.39	.72	1.43	32.30	2.70	1.00
109	942- 3	37.	10.	4.	66.10	.10	1.20	2.10	.22	17.15	12.70	.66	1.43	32.30	2.70	1.00
110	942-13	38.	10.	5.	92.50	-.20	1.20	2.10	.18	22.86	9.53	.93	1.55	32.30	2.70	1.00
111	942-23	41.	10.	4.	59.30	-.20	1.20	2.10	.18	17.15	8.16	.59	1.72	32.30	2.70	1.00
112	942-33	51.	10.	4.	69.60	.30	1.20	2.10	.35	13.72	8.16	.70	2.06	32.30	2.70	1.00
113	943- 9	52.	7.	4.	78.30	-.10	1.20	2.10	.35	8.57	8.79	.78	1.95	32.30	2.70	1.00
114	943-19	36.	0.	4.	151.80	-3.30	1.20	2.10	.35	7.62	7.62	1.52	2.12	32.30	2.70	1.00
115	943-29	34.	4.	4.	54.40	-1.00	1.20	2.10	.35	8.57	6.02	.54	2.62	32.30	2.70	1.00
116	944- 4	40.	5.	4.	83.20	-1.60	1.20	2.00	.35	11.43	6.72	.83	1.98	32.30	2.70	1.00
117	944-14	44.	9.	4.	51.90	-1.50	1.20	2.00	.35	13.72	7.62	.52	1.94	32.30	2.70	1.00
118	944-24	47.	10.	4.	32.80	-1.60	1.20	2.00	.35	7.62	7.14	.33	2.33	32.30	2.70	1.00
119	944-34	44.	2.	3.	51.80	-7.00	1.20	2.00	.35	7.62	8.16	.52	2.53	32.30	2.70	1.00
120	945- 9	47.	3.	3.	62.10	-7.20	1.20	2.00	.35	9.80	7.62	.62	2.06	32.30	2.70	1.00
121	945-19	49.	3.	3.	118.50	2.50	1.20	2.00	.35	4.29	6.35	1.19	1.83	32.30	2.70	1.00
122	945-29	62.	1.	3.	54.70	.10	1.20	2.00	.20	11.43	9.53	.55	2.01	32.30	2.70	1.00
123	946- 4	42.	8.	3.	67.70	.20	1.20	2.00	.20	6.86	8.16	.68	2.04	32.30	2.70	1.00
124	946-14	46.	10.	3.	45.10	-.40	1.20	2.00	.20	9.80	9.53	.45	1.83	32.30	2.70	1.00
125	946-24	46.	10.	3.	47.30	.20	1.20	2.00	.20	17.15	11.43	.47	1.72	32.30	2.70	1.00
126	946-34	46.	10.	2.	47.50	.40	1.20	2.00	.20	17.15	14.29	.48	1.74	32.30	2.70	1.00
127	947- 9	45.	10.	2.	46.80	.20	1.20	2.00	.36	17.15	14.29	.47	1.68	32.30	2.70	1.00
128	947-19	47.	10.	2.	36.00	-.20	1.20	2.00	.18	17.15	14.29	.36	1.68	32.30	2.70	1.00
129	947-29	48.	10.	2.	34.50	0.00	1.20	2.00	.18	17.15	14.29	.35	1.68	32.30	2.70	1.00
130	948- 4	47.	10.	2.	35.20	-.20	1.20	2.00	.18	17.15	16.33	.35	1.32	32.30	2.70	1.00
131	948-14	51.	10.	1.	41.20	-.30	1.20	2.00	.29	22.86	19.05	.41	1.62	32.30	2.70	1.00
132	948-24	51.	10.	1.	37.20	-.40	1.20	2.00	.29	22.86	16.33	.37	1.29	32.30	2.70	1.00
133	948-34	52.	10.	1.	23.50	-.10	1.20	2.00	.40	22.86	19.05	.24	1.43	32.30	2.70	1.00
134	949- 9	53.	10.	0.	32.70	-.20	1.20	2.00	.40	22.86	16.33	.33	1.00	32.30	2.70	1.00
135	949-19	53.	10.	0.	33.70	0.00	1.20	2.00	.40	17.15	12.70	.34	.86	32.30	2.70	1.00
136	949-29	56.	10.	0.	39.80	-.20	1.20	2.00	.22	17.15	12.70	.40	1.72	32.30	2.70	1.00
137	950- 4	54.	9.	0.	37.60	.20	1.20	2.00	.22	22.86	14.29	.38	2.10	32.30	2.70	1.00
138	950-14	52.	10.	0.	28.10	.40	1.10	2.00	.34	17.15	14.29	.28	1.22	32.30	2.70	1.00
139	950-24	55.	10.	0.	27.40	.60	1.10	2.00	.34	13.72	14.29	.27	2.04	32.30	2.70	1.00
140	950-34	55.	10.	0.	33.70	.40	1.10	2.00	.28	17.15	12.70	.34	1.68	32.30	2.70	1.00
141	951- 9	55.	10.	0.	35.20	-.30	1.10	2.00	.35	17.15	12.70	.35	1.88	32.30	2.70	1.00
142	951-19	57.	10.	0.	39.50	-.70	1.10	2.00	.35	17.15	14.29	.40	2.05	32.30	2.70	1.00
143	951-29	59.	10.	0.	45.30	-.90	1.10	2.00	.25	17.15	11.43	.45	1.65	32.30	2.70	1.00
144	952- 4	60.	10.	0.	44.40	-.70	1.10	2.00	.25	17.15	14.29	.44	1.40	32.30	2.70	1.00
145	952-14	59.	10.	1.	44.10	-.40	1.10	2.00	.29	17.15	12.70	.44	1.86	32.30	2.70	1.00
146	952-24	61.	10.	1.	45.50	-.20	1.10	2.00	.29	13.72	8.79	.46	1.49	32.30	2.70	1.00
147	952-34	62.	10.	1.	45.30	-.40	1.10	2.00	.32	11.43	11.43	.45	1.52	32.30	2.70	1.00
148	953- 9	62.	10.	1.	45.60	-.60	1.10	2.00	.34	17.15	9.53	.46	1.83	32.30	2.70	1.00
149	953-19	60.	10.	1.	41.60	-.70	1.10	2.00	.34	22.86	8.16	.42	1.86	32.30	2.70	.67
150	953-29	60.	10.	1.	42.50	-.60	1.10	2.00	.23	17.15	6.35	.43	1.34	32.30	2.70	.67

	TRANSECT	STRK	DFQ3	INFQ	OPDX	RSLX	TDRG	STSG	SEDS	OFS5	OFS9	ISLW	LAGW	WFQ1	WFQ3	BARS
151	954- 4	62.	10.	1.	38.20	-.40	1.10	2.00	.23	22.86	7.14	.38	1.43	32.30	2.70	.67
152	954-14	60.	10.	1.	38.30	-.50	1.10	2.00	.23	22.86	6.35	.38	.69	32.30	2.70	.67
153	954-24	62.	9.	1.	35.50	-.90	1.10	2.00	.26	17.15	6.35	.36	.99	32.30	2.70	.67
154	954-34	62.	10.	1.	35.00	-1.10	1.10	2.00	.30	17.15	4.97	.35	1.71	32.30	2.70	1.00
155	955- 9	62.	10.	1.	27.20	-.80	1.10	2.00	.30	13.72	9.53	.27	2.18	32.30	2.70	1.00
156	955-19	71.	9.	1.	37.90	-.30	1.10	2.00	.23	9.80	6.72	.38	6.80	32.30	2.70	1.00
157	955-29	45.	2.	1.	127.60	-2.80	1.10	1.90	.23	5.28	3.01	1.28	4.45	32.30	2.70	1.00
158	956- 4	64.	6.	2.	83.40	-5.40	1.10	1.90	.23	7.62	3.27	.83	4.27	32.30	2.70	1.00
159	956-14	59.	10.	2.	58.10	-3.10	1.10	1.90	.23	13.72	2.79	.56	.98	32.30	2.70	.50
160	956-24	55.	10.	2.	64.40	-1.50	1.10	1.80	.23	17.15	4.23	.64	0.00	32.30	2.70	.50
161	956-34	52.	10.	2.	65.20	-.90	1.10	1.80	.23	13.72	4.97	.65	0.00	32.30	2.70	.50
162	957- 9	52.	10.	2.	45.70	-.60	1.10	1.80	.23	4.57	3.57	.46	0.00	32.30	2.70	.50
163	957-19	52.	10.	3.	39.80	-.20	1.10	1.80	.23	13.72	4.57	.40	0.00	32.30	2.70	.50
164	957-29	50.	10.	3.	41.70	-.20	1.10	1.80	.23	13.72	6.35	.42	0.00	32.30	2.70	1.00
165	958- 4	50.	8.	3.	38.20	.10	1.10	1.80	.23	13.72	9.53	.38	0.00	32.30	2.70	1.00
166	958-14	52.	9.	3.	37.50	.40	1.10	1.80	.23	13.72	11.43	.38	0.00	32.30	2.70	1.00
167	958-24	53.	10.	3.	42.00	.40	1.10	1.80	.23	17.15	12.70	.42	0.00	32.30	2.70	1.00
168	958-34	60.	10.	3.	39.20	1.20	1.10	1.80	.23	13.72	10.39	.39	0.00	32.30	2.70	1.00
169	959- 9	63.	10.	4.	47.60	1.10	1.10	1.80	.23	13.72	11.43	.48	0.00	32.30	2.70	1.00
170	959-19	48.	5.	3.	61.10	1.90	1.10	1.80	.23	8.57	9.53	.61	1.22	32.30	2.70	1.00
171	959-29	56.	10.	3.	62.90	-1.40	1.10	1.90	.23	11.43	10.39	.63	1.29	32.30	2.70	1.00
172	960- 5	58.	9.	3.	85.60	-1.80	1.10	1.90	.23	11.43	10.39	.86	1.85	32.30	2.70	1.00
173	960-15	63.	10.	3.	100.60	-1.00	1.10	1.90	.23	9.80	8.79	1.01	2.80	32.30	2.70	1.00
174	960-25	64.	10.	3.	29.80	-.50	1.10	1.90	.23	7.62	7.62	.30	2.30	32.30	2.70	1.00
175	960-35	55.	4.	3.	62.10	1.00	1.10	1.90	.23	6.23	7.14	.62	2.29	32.30	2.70	1.00
176	961-11	69.	5.	3.	78.50	-.10	1.10	1.90	.23	6.23	7.14	.79	2.39	32.30	2.70	1.00
177	961-21	64.	10.	3.	69.00	1.00	1.10	1.90	.23	9.80	7.14	.69	2.38	32.30	2.70	1.00
178	961-31	68.	10.	3.	80.80	1.80	1.10	1.90	.23	11.43	8.79	.81	2.57	32.30	2.70	1.00
179	962- 8	70.	10.	3.	77.90	2.20	1.10	1.90	.23	9.80	8.79	.78	3.30	32.30	2.70	1.30
180	962-18	74.	10.	3.	87.20	3.70	1.10	1.90	.23	7.62	7.14	.87	3.95	32.30	2.70	1.30
181	962-28	61.	2.	3.	206.20	12.70	1.10	1.90	.23	4.29	6.02	2.06	4.88	32.30	2.70	1.30
182	963-02	16.	0.	0.	--	--	1.10	1.90	.25	4.99	15.24	0.00	4.94	32.30	2.70	1.30
183	963-12	90.	2.	2.	89.80	-2.40	1.10	1.90	.25	7.62	7.62	.90	3.57	32.30	2.70	1.30
184	963-22	67.	8.	2.	64.80	-.90	1.10	1.90	.25	11.43	11.43	.65	2.01	32.30	2.70	.67
185	963-32	71.	10.	2.	69.60	-.80	1.10	1.90	.22	13.72	12.70	.70	1.74	29.10	2.50	.67
186	964- 7	72.	10.	2.	49.80	-.10	1.10	1.90	.26	13.72	12.70	.50	1.71	29.10	2.50	.67
187	964-17	75.	10.	2.	40.20	.50	1.10	1.90	.26	11.43	12.70	.40	1.65	29.10	2.50	.67
188	964-27	72.	10.	1.	41.40	0.00	1.10	1.80	.24	13.72	16.33	.41	2.26	29.10	2.50	.67
189	965- 2	73.	10.	1.	45.20	-.20	1.10	1.80	.21	13.72	14.29	.45	2.21	29.10	2.50	1.00
190	965-12	74.	10.	1.	41.60	0.00	1.10	1.80	.21	17.15	14.29	.42	1.10	29.10	2.50	1.00
191	965-22	75.	10.	1.	43.70	0.00	1.10	1.60	.29	17.15	14.29	.44	1.41	29.10	2.50	1.00
192	965-32	76.	10.	1.	37.00	-.70	1.10	1.60	.33	13.72	14.29	.37	2.57	29.10	2.50	1.00
193	966- 7	77.	10.	1.	32.80	-.70	1.10	1.80	.33	13.72	14.29	.33	1.64	29.10	2.50	1.00
194	966-17	77.	10.	1.	32.20	-.50	1.10	1.80	.24	11.43	12.70	.32	2.73	29.10	2.50	1.00
195	966-27	77.	10.	0.	30.40	-.10	1.10	1.80	.28	13.72	14.29	.30	3.05	29.10	2.50	1.00
196	967- 2	79.	10.	0.	34.90	.20	1.10	1.80	.28	17.15	14.29	.35	3.22	29.10	2.50	1.00
197	967-12	79.	10.	0.	19.50	.30	1.10	1.80	.32	11.43	12.70	.20	3.47	29.10	2.50	1.00
198	967-22	80.	10.	0.	53.70	0.00	1.10	1.80	.24	13.72	14.29	.54	3.55	29.10	2.50	1.00
199	967-32	80.	10.	0.	50.40	.30	1.10	1.80	.24	13.72	14.29	.50	3.93	29.10	2.50	1.00
200	968- 7	80.	10.	0.	65.60	-.50	1.10	1.80	.32	17.15	16.33	.66	4.07	29.10	2.50	1.00

	TRANSECT	STRK	DFQ3	INFQ	OPDX	RSLX	TDRG	STSG	SEDS	OFS5	OFS9	ISLW	LAGW	WFQ1	WFQ3	BARS
201	968-17	80.	10.	0.	61.20	-.60	1.10	1.80	.18	17.15	14.29	.61	3.97	29.10	2.50	1.00
202	968-27	81.	10.	0.	46.70	-.40	1.10	1.80	.18	17.15	16.33	.47	4.01	29.10	2.50	1.00
203	969- 2	81.	10.	0.	43.80	0.00	1.10	1.80	.29	17.15	16.33	.44	4.09	29.10	2.50	1.00
204	969-12	82.	10.	0.	42.50	-.10	1.10	1.80	.29	22.86	22.86	.43	3.87	29.10	2.50	1.00
205	969-22	82.	10.	0.	30.50	-.40	1.10	1.70	.33	17.15	16.33	.31	3.78	29.10	2.50	1.00
206	969-32	83.	10.	0.	40.20	-.30	1.10	1.70	.28	13.72	11.43	.40	3.82	29.10	2.50	1.00
207	970- 7	81.	10.	0.	43.50	-.30	1.10	1.70	.28	13.72	11.43	.44	3.59	29.10	2.50	1.00
208	970-17	82.	10.	0.	37.30	-.10	1.10	1.70	.23	11.43	12.70	.37	2.90	29.10	2.50	1.00
209	970-27	83.	10.	0.	41.20	-.40	1.10	1.70	.37	11.43	11.43	.41	2.51	29.10	2.50	1.00
210	971- 2	83.	10.	0.	48.30	-.20	1.10	1.70	.29	13.72	10.39	.48	2.54	29.10	2.50	1.00
211	971-12	83.	10.	1.	37.60	-.20	1.10	1.70	.29	11.43	11.43	.38	2.47	29.10	2.50	1.00
212	971-22	86.	10.	1.	37.60	-.20	1.10	1.70	.20	13.72	10.39	.38	2.41	29.10	2.50	1.00
213	971-32	85.	10.	1.	40.70	.10	1.10	1.70	.20	9.80	10.39	.41	2.40	29.10	2.50	1.00
214	972- 8	87.	10.	1.	32.70	.10	1.10	1.70	.27	9.80	9.53	.33	2.26	29.10	2.50	1.00
215	972-18	88.	10.	1.	40.20	.60	1.10	1.70	.23	9.80	8.79	.40	1.85	29.10	2.50	1.00
216	972-28	90.	10.	1.	63.40	.20	1.10	1.70	.23	9.80	8.16	.63	1.11	29.10	2.50	1.00
217	973- 4	92.	9.	1.	31.50	.10	1.10	1.70	.23	8.57	7.62	.32	2.10	29.10	2.50	1.00
218	973-14	94.	8.	1.	30.00	-.80	1.10	1.70	.26	8.57	6.72	.30	1.71	29.10	2.50	1.00
219	973-24	97.	5.	1.	34.80	-.50	1.10	1.70	.26	8.57	6.02	.35	1.79	29.10	2.50	1.00
220	973-34	100.	9.	1.	63.70	-.10	1.10	1.60	.25	5.72	4.97	.64	.55	29.10	2.50	1.00
221	974-12	94.	9.	1.	77.20	.40	1.10	1.60	.25	4.03	3.81	.77	2.01	29.10	2.50	1.00
222	974-22	88.	9.	1.	78.40	-.10	1.10	1.60	.25	1.96	2.54	.78	2.56	29.10	2.50	1.00
223	974-32	120.	1.	0.	84.00	-.10	1.10	1.60	.25	1.77	10.16	.84	2.68	29.10	2.50	1.00
224	976-16	157.	0.	0.	—	—	1.10	1.60	.24	2.29	2.79	0.00	.20	25.70	2.10	0.00
225	976-26	157.	0.	1.	322.98	11.26	1.10	1.60	.24	2.21	3.18	.64	2.70	25.70	2.10	0.00
226	977- 1	129.	0.	1.	309.33	15.47	1.10	1.60	.24	2.74	4.08	.72	2.90	25.70	2.10	0.00
227	977-11	101.	1.	2.	311.73	5.22	1.10	1.60	.24	7.62	5.72	.92	2.80	25.70	2.10	0.00
228	977-21	103.	2.	2.	111.85	-.81	1.10	1.60	.24	8.57	6.35	.95	2.80	25.70	2.10	0.00
229	977-31	105.	3.	2.	124.00	-1.44	1.10	1.60	.24	11.43	7.62	.70	10.50	25.70	2.10	1.00
230	978- 8	108.	6.	2.	146.33	-1.58	1.10	1.60	.24	13.72	8.79	.53	6.60	25.70	2.10	1.00
231	978-18	108.	5.	2.	190.11	-1.45	1.10	1.60	.24	13.72	10.39	.62	5.90	25.70	2.10	1.00
232	978-28	110.	3.	2.	119.80	-1.56	1.10	1.60	.24	13.72	9.53	.72	6.20	25.70	2.10	1.00
233	979- 5	113.	2.	2.	86.02	-2.20	1.10	1.60	.24	17.15	11.43	.53	6.90	25.70	2.10	1.00
234	979-15	113.	0.	2.	173.98	-2.51	1.10	1.60	.24	17.15	10.39	.53	7.60	25.70	2.10	.33
235	979-25	118.	0.	2.	164.24	-2.60	1.10	1.60	.24	17.15	9.53	.34	8.00	25.70	2.10	.33
236	980- 3	123.	0.	2.	120.68	-1.60	1.10	1.60	.24	17.15	8.79	.72	7.90	25.70	2.10	.33
237	980-13	131.	2.	1.	142.56	-1.29	1.10	1.60	.24	13.72	8.79	1.20	7.90	25.70	2.10	.33
238	980-23	150.	2.	1.	119.65	1.51	1.10	1.60	.24	2.86	4.57	1.22	8.70	25.70	2.10	.33
239	980-33	143.	4.	1.	148.74	-.38	1.10	1.60	.24	1.91	3.09	0.00	8.90	24.30	1.80	.33
240	981-10	194.	0.	1.	181.19	7.50	1.10	1.60	.24	34.29	38.10	.15	1.71	24.30	1.80	.33
241	981-20	181.	0.	1.	117.26	2.95	1.10	1.60	.24	9.80	14.29	.23	3.41	24.30	1.80	.33
242	981-30	151.	2.	1.	208.79	-.21	1.10	1.60	.24	13.72	19.05	1.06	.55	24.30	1.80	.33
243	982-10	144.	4.	1.	195.79	-3.33	1.10	1.60	.24	11.43	9.53	1.52	6.36	24.30	1.80	.33
244	982-20	145.	8.	1.	82.64	-4.24	1.10	1.60	.24	7.62	5.72	.43	5.62	24.30	1.80	.33
245	982-30	145.	0.	1.	182.14	-3.90	1.10	1.60	.24	5.28	4.76	0.00	6.57	32.30	2.70	.33
246	983-11	360.	0.	1.	137.49	-2.38	1.10	1.80	.24	11.43	2.93	.24	5.54	32.30	2.70	.33
247	983-21	8.	0.	1.	206.43	-.66	1.10	1.80	.24	11.43	3.01	1.32	3.60	32.30	2.70	.33
248	983-31	16.	0.	1.	207.36	-2.40	1.10	1.80	.38	11.43	4.08	2.16	2.53	32.30	2.70	.33
249	984- 9	22.	0.	1.	291.87	-1.28	1.10	1.80	.35	11.43	4.76	.46	2.27	32.30	2.70	1.00
250	984-19	26.	0.	1.	278.73	1.02	1.10	1.80	.35	11.43	5.20	.44	.68	32.30	2.70	1.00

	TRANSECT	STRK	DFQ3	INFQ	OPDX	RSLX	TDRG	STSG	SEDS	OFS5	OFS9	ISLW	LAGW	WFQ1	WFQ3	BARS
251	984-29	29.	0.	1.	256.77	2.19	1.10	1.80	.40	17.15	7.14	.59	.65	32.30	2.70	1.00
252	985- 8	27.	2.	1.	205.12	1.62	1.10	1.80	.35	13.72	6.02	.43	11.96	32.30	2.70	1.00
253	985-18	27.	0.	0.	185.66	1.34	1.10	1.80	.35	13.72	6.02	.51	11.60	32.30	2.70	1.00
254	985-28	29.	0.	0.	156.77	.44	1.10	1.80	.49	13.72	5.44	.55	11.66	32.30	2.70	1.00
255	986- 4	31.	0.	0.	153.75	.22	1.10	1.80	.49	17.15	7.62	.38	3.32	32.30	2.70	1.00
256	986-14	34.	0.	0.	163.92	.20	1.10	1.80	.31	22.86	8.79	.81	3.16	32.30	2.70	1.00
257	986-24	34.	0.	0.	180.28	-.29	1.10	1.80	.33	17.15	8.79	1.21	3.20	32.30	2.70	1.00
258	986-34	34.	0.	0.	183.67	.06	1.10	1.80	.34	13.72	9.53	1.01	5.89	32.30	2.70	1.00
259	987- 9	34.	0.	0.	214.13	-.26	1.10	1.80	.35	17.15	8.16	1.19	3.87	32.30	2.70	1.00
260	987-19	34.	0.	0.	181.32	.41	1.10	1.80	.35	13.72	7.62	1.02	3.95	32.30	2.70	1.00
261	987-29	35.	0.	0.	163.32	.38	1.10	1.80	.40	9.80	7.14	1.18	3.58	32.30	2.70	1.00
262	988- 5	36.	0.	0.	177.89	.52	1.10	1.80	.40	11.43	6.72	1.05	6.08	32.30	2.70	1.00
263	988-15	37.	1.	0.	156.63	-.19	1.10	1.80	.35	13.72	7.62	.75	5.85	32.30	2.70	1.00
264	988-25	37.	1.	0.	150.26	-.26	1.10	1.80	.31	11.43	8.16	.48	5.11	32.30	2.70	1.00
265	988-35	37.	0.	0.	181.00	.03	1.10	1.80	.31	13.72	8.79	.90	4.33	32.30	2.70	1.00
266	989-11	37.	0.	0.	218.87	.59	1.10	1.80	.36	13.72	9.53	.87	4.61	32.30	2.70	1.00
267	989-21	37.	0.	0.	215.23	.87	1.10	1.80	.42	13.72	9.53	0.00	3.90	32.30	2.70	1.00
268	989-31	37.	0.	0.	236.29	.26	1.10	1.80	.42	13.72	9.53	.34	5.38	32.30	2.70	1.00
269	990- 7	37.	0.	0.	192.77	.36	1.10	1.80	.29	13.72	8.79	.98	4.97	32.30	2.70	1.00
270	990-17	35.	0.	0.	209.80	.35	1.10	1.80	.29	11.43	8.16	.99	5.15	32.30	2.70	1.00
271	990-27	35.	0.	0.	195.10	-.13	1.10	1.80	.28	13.72	8.16	1.27	5.09	32.30	2.70	1.00
272	991- 4	37.	0.	1.	199.92	.41	1.10	1.80	.28	17.15	7.62	.63	5.32	32.30	2.70	1.00
273	991-14	39.	0.	1.	185.98	.36	1.10	1.80	.28	17.15	7.62	.41	5.80	32.30	2.70	1.00
274	991-24	42.	0.	1.	215.24	.04	1.10	1.80	.28	22.86	8.79	.60	4.47	32.30	2.70	1.00
275	991-34	42.	0.	1.	188.39	.34	1.10	1.80	.30	22.86	9.53	.81	5.65	32.30	2.70	1.00
276	992-10	42.	0.	1.	197.22	.93	1.10	1.80	.33	17.15	9.53	.93	5.52	32.30	2.70	1.00
277	992-20	42.	0.	1.	213.45	.07	1.10	1.80	.33	17.15	10.39	.59	5.35	32.30	2.70	1.00
278	992-30	40.	0.	1.	186.84	-.81	1.10	1.80	.33	13.72	9.53	.43	4.45	32.30	2.70	1.00
279	993- 5	41.	0.	1.	164.62	-1.50	1.10	1.80	.33	13.72	8.79	.41	4.88	32.30	2.70	1.00
280	993-15	41.	0.	1.	149.45	-2.97	1.10	1.80	.33	11.43	8.79	.33	4.80	32.30	2.70	1.00
281	993-25	48.	0.	1.	178.13	-4.03	1.20	1.80	.30	8.57	7.62	.16	3.97	32.30	2.70	1.00
282	993-35	11.	0.	1.	224.78	-4.84	1.10	1.80	.28	6.86	8.16	.14	3.09	32.30	2.70	1.00
283	994- 9	68.	0.	1.	173.42	-6.89	1.10	1.80	.28	11.43	9.53	.18	3.32	32.30	2.70	1.00
284	994-19	54.	0.	1.	218.36	-4.48	1.10	1.80	.28	11.43	9.53	.37	3.34	32.30	2.70	1.00
285	994-29	53.	0.	1.	252.54	-1.76	1.10	1.80	.28	13.72	9.53	.57	3.46	32.30	2.70	1.00
286	995- 3	48.	0.	1.	264.44	-.03	1.10	1.80	.28	8.57	8.79	.24	4.07	32.30	2.70	1.00
287	995-13	50.	0.	1.	208.62	1.64	1.10	1.80	.28	8.57	9.53	.36	4.11	32.30	2.70	1.00
288	995-23	48.	0.	1.	177.78	.70	1.10	1.80	.28	9.80	7.62	.48	4.17	32.30	2.70	1.00
289	995-33	48.	0.	1.	173.68	-.27	1.10	1.80	.28	9.80	8.16	.63	4.40	32.30	2.70	1.00
290	996- 7	49.	2.	1.	207.55	-1.27	1.10	1.80	.28	8.57	8.16	.41	5.13	32.30	2.70	1.00
291	996-17	48.	0.	1.	224.83	-1.26	1.10	1.80	.28	11.43	8.16	.48	4.43	32.30	2.70	1.00
292	996-27	48.	0.	1.	229.55	-1.00	1.10	1.80	.26	11.43	8.16	.52	5.21	32.30	2.70	1.00
293	997- 1	43.	0.	1.	265.08	-.89	1.10	1.80	.26	11.43	8.16	.45	5.69	32.30	2.70	1.00
294	997-11	44.	1.	1.	217.18	-.51	1.10	1.80	.26	9.80	8.79	.49	5.88	32.30	2.70	1.33
295	997-21	41.	0.	0.	229.23	-.54	1.10	1.80	.26	11.43	9.53	.53	5.99	32.30	2.70	1.33
296	997-31	45.	0.	0.	245.87	-.80	1.10	1.80	.26	11.43	10.39	.59	5.69	32.30	2.70	1.33
297	998- 5	43.	4.	0.	203.97	-.88	1.10	1.80	.26	9.80	9.53	.62	6.01	32.30	2.70	1.33
298	998-15	46.	1.	0.	207.00	-.89	1.10	1.80	.26	9.80	9.53	.90	6.14	32.30	2.70	1.33
299	998-25	47.	2.	0.	214.11	-.94	1.10	1.80	.26	11.43	8.79	1.04	39.50	32.30	2.70	1.33
300	998-35	47.	0.	0.	298.56	-.79	1.10	1.80	.26	11.43	8.79	.94	42.27	32.30	2.70	1.30

	TRANSECT	STRK	DFQ3	INFQ	OPDX	RSLX	TDRG	STSG	SEDS	OFS5	OFS9	ISLW	LAGW	WFQ1	WFQ3	BARS
301	999- 9	46.	0.	0.	260.59	-.04	1.10	1.80	.32	11.43	8.16	1.16	41.78	32.30	2.70	1.00
302	999-19	48.	0.	0.	294.52	.12	1.10	1.80	.32	11.43	8.16	.67	42.35	32.30	2.70	1.00
303	999-29	48.	0.	0.	274.87	-.77	1.10	1.80	.32	11.43	7.62	.16	41.66	32.30	2.70	1.00
304	1000- 3	47.	0.	0.	438.87	-.08	1.10	1.80	.31	9.80	7.62	1.12	41.86	32.30	2.70	1.00
305	1000-13	48.	0.	1.	712.84	-.14	1.10	1.80	.30	9.80	7.62	1.23	42.96	32.30	2.70	1.00
306	1000-23	47.	0.	1.	869.63	.14	1.10	1.80	.30	7.62	10.39	.30	40.90	32.30	2.70	1.00
307	1000-33	47.	0.	1.	889.83	.19	1.10	1.80	.30	11.43	9.53	1.22	42.00	32.30	2.70	1.00
308	1001- 8	49.	0.	1.	567.78	1.20	1.10	1.80	.30	7.62	8.79	1.16	42.06	32.30	2.70	1.00
309	1001-18	49.	0.	1.	532.78	.39	1.10	1.80	.30	11.43	8.79	1.49	41.86	32.30	2.70	1.00
310	1001-28	50.	0.	1.	777.38	-.38	1.10	1.80	.30	11.43	7.62	1.32	41.80	32.30	2.70	1.00
311	1002- 2	46.	0.	1.	936.26	-1.32	1.10	1.80	.30	11.43	7.62	1.47	41.45	32.30	2.70	1.00
312	1002-12	47.	0.	1.	1033.08	-2.10	1.10	1.80	.30	9.80	5.44	1.40	42.10	32.30	2.70	1.00
313	1002-22	51.	0.	1.	1182.05	-1.77	1.10	1.80	.27	9.80	4.76	2.32	39.38	32.30	2.70	1.00
314	1002-32	53.	0.	1.	1452.52	-1.51	1.10	1.80	.26	8.57	4.40	2.27	39.22	32.30	2.70	1.00
315	1003- 9	55.	0.	1.	1535.09	-1.50	1.10	1.80	.26	8.57	3.94	2.67	38.00	32.30	2.70	1.00
316	1003-19	57.	0.	1.	1364.64	-.98	1.10	1.80	.26	5.72	3.36	1.71	38.57	32.30	2.70	1.00
317	1003-29	40.	0.	0.	1080.22	-7.40	1.10	1.80	.26	4.29	3.27	0.00	37.84	32.30	2.70	1.00
318	1005-06	18.	0.	0.	485.00	—	1.10	1.80	.26	2.14	3.18	0.00	37.73	32.30	2.70	1.25
319	1005-16	78.	0.	1.	325.34	-6.22	1.10	1.80	.26	4.03	4.40	.60	38.32	32.30	2.70	1.25
320	1005-26	65.	0.	1.	549.24	7.88	1.10	1.80	.26	4.57	5.20	.71	36.60	32.30	2.70	1.25
321	1005-36	40.	0.	1.	671.04	-.23	1.10	1.80	.25	11.43	5.72	.68	35.03	32.30	2.70	1.25
322	1006-11	45.	0.	1.	692.56	-1.85	1.10	1.80	.25	13.72	10.39	.96	33.26	32.30	2.70	1.25
323	1006-21	47.	0.	1.	533.28	3.72	1.10	1.80	.27	11.43	8.79	1.02	33.24	32.30	2.70	1.25
324	1006-31	50.	0.	1.	494.40	5.47	1.10	1.80	.24	11.43	7.62	2.48	31.15	32.30	2.70	1.25
325	1007- 9	53.	0.	1.	514.64	5.75	1.00	1.70	.26	13.72	8.79	2.45	31.09	32.30	2.70	1.25
326	1007-19	56.	0.	1.	503.84	4.40	1.00	1.70	.28	13.72	10.39	.81	30.20	32.30	2.70	1.25
327	1007-29	58.	0.	1.	462.28	3.17	1.00	1.70	.28	17.15	11.43	.75	31.76	32.30	2.70	1.25
328	1008- 4	58.	0.	1.	450.44	1.04	1.00	1.70	.32	17.15	11.43	.99	30.24	32.30	2.70	1.25
329	1008-14	61.	0.	1.	374.04	1.05	1.00	1.70	.31	17.15	12.70	.84	30.07	32.30	2.70	1.00
330	1008-24	62.	2.	1.	149.46	.58	1.00	1.70	.31	17.15	14.29	.88	30.13	32.30	2.70	1.00
331	1008-34	63.	1.	0.	120.32	-.10	1.00	1.70	.32	17.15	14.29	.88	29.93	32.30	2.70	1.00
332	1009- 9	63.	2.	0.	170.86	.01	1.00	1.70	.36	17.15	16.33	.85	33.18	32.30	2.70	1.00
333	1009-19	66.	0.	1.	158.04	.82	1.00	1.70	.33	17.15	16.33	.73	34.34	32.30	2.70	1.00
334	1009-29	65.	5.	1.	145.26	-.35	1.00	1.70	.38	17.15	19.05	.82	33.65	32.30	2.70	1.25
335	1010- 4	63.	4.	1.	111.50	-.26	1.00	1.70	.35	13.72	10.39	.76	31.94	32.30	2.70	1.25
336	1010-14	66.	3.	1.	97.76	-.37	1.00	1.70	.37	11.43	11.43	.54	32.72	32.30	2.70	1.25
337	1010-24	64.	3.	1.	95.40	-1.46	1.00	1.70	.31	11.43	10.39	.65	34.95	32.30	2.70	1.25
338	1010-34	65.	5.	1.	83.14	-1.20	1.00	1.70	.46	8.57	11.43	.76	34.79	32.30	2.70	1.25
339	1011- 9	65.	1.	1.	99.60	-1.38	1.00	1.70	.36	8.57	10.39	.69	35.78	32.30	2.70	1.25
340	1011-19	66.	3.	1.	100.74	-.81	1.00	1.70	.30	7.62	10.39	.43	37.51	32.30	2.70	1.25
341	1011-29	65.	1.	1.	160.12	-1.20	1.00	1.70	.37	7.62	10.39	.63	37.80	32.30	2.70	1.25
342	1012- 5	66.	0.	1.	179.08	-2.04	1.00	1.70	.29	7.62	9.53	.42	38.20	32.30	2.70	1.25
343	1012-15	67.	0.	1.	216.98	-2.85	1.00	1.70	.30	6.23	8.79	.61	38.34	32.30	2.70	1.25
344	1012-25	67.	1.	1.	258.98	-1.07	1.00	1.70	.44	5.28	7.14	.90	37.90	32.30	2.70	1.25
345	1013-10	59.	0.	0.	408.59	6.33	1.00	1.70	.44	4.90	6.02	0.00	40.50	32.30	2.70	1.25
346	1013-20	75.	0.	0.	—	—	1.00	1.70	.44	4.90	5.44	0.00	41.21	32.30	2.70	1.25
347	1013-30	65.	0.	0.	—	—	1.00	1.70	.41	4.90	5.44	.52	42.35	32.30	2.70	1.25
348	1014- 8	74.	0.	1.	540.59	10.13	1.00	1.70	.39	6.23	5.72	.78	41.72	32.30	2.70	1.25
349	1014-18	69.	1.	1.	350.10	-3.21	1.00	1.70	.39	8.57	7.62	.93	41.41	32.30	2.70	1.25
350	1014-28	63.	5.	1.	146.35	-1.84	1.00	1.70	.46	9.80	10.39	.38	42.49	32.30	2.70	1.25

	TRANSECT	STRK	DFQ3	INFQ	OPDX	RSLX	TDRG	STSG	SEDS	OFS5	OFS9	ISLW	LA.	WFQ1	WFQ3	BARS
351	1015- 3	65.	2.	1.	168.47	1.33	1.00	1.70	.47	8.57	8.79	.59	41.41	32.30	2.70	1.25
352	1015-13	67.	4.	1.	137.56	1.66	1.00	1.70	.42	7.62	10.39	1.16	43.40	32.30	2.70	1.25
353	1015-23	66.	7.	1.	94.84	.49	1.00	1.70	.36	7.62	9.53	1.74	42.65	32.30	2.70	1.25
354	1015-33	68.	6.	1.	89.85	-.64	1.00	1.70	.50	7.62	9.53	2.21	42.08	32.30	2.70	1.25
355	1016- 7	69.	2.	1.	101.78	-.64	1.00	1.70	.52	7.62	10.39	.27	41.86	32.30	2.70	1.25
356	1016-17	68.	3.	1.	98.34	-.27	1.00	1.70	.44	8.57	11.43	.27	44.09	32.30	2.70	1.25
357	1016-27	70.	8.	1.	107.71	-.39	1.10	1.70	.35	8.57	11.43	.47	44.30	32.30	2.70	1.25
358	1017- 2	72.	8.	1.	79.96	-.32	1.10	1.70	.37	8.57	11.43	.76	44.36	32.30	2.70	1.25
359	1017-12	74.	10.	1.	67.19	.18	1.10	1.70	.33	8.57	11.43	1.30	44.30	32.30	2.70	1.00
360	1017-22	76.	10.	0.	64.02	.51	1.10	1.70	.38	9.80	11.43	2.02	42.92	32.30	2.70	1.00
361	1017-32	77.	10.	0.	79.73	1.02	1.10	1.70	.48	8.57	10.39	2.32	42.94	32.30	2.70	1.00
362	1018- 7	83.	10.	0.	103.25	.90	1.10	1.70	.46	9.80	11.43	3.84	44.05	32.30	2.70	1.00
363	1018-17	83.	10.	0.	137.45	1.88	1.10	1.70	.30	11.43	12.70	3.17	44.40	32.30	2.70	1.00
364	1018-27	90.	6.	0.	144.08	2.68	1.10	1.70	.35	17.15	22.86	3.15	45.23	32.30	2.70	1.00
365	1019- 4	96.	9.	0.	148.80	3.53	1.10	1.70	.44	13.72	10.39	4.02	45.52	32.30	2.70	1.00
366	1019-14	104.	8.	0.	111.80	3.42	1.10	1.70	.44	11.43	9.53	4.66	47.06	32.30	2.70	1.00
367	1019-24	120.	8.	0.	217.83	2.41	1.10	1.70	.44	11.43	6.35	4.74	48.16	32.30	2.70	1.00
368	1019-34	104.	0.	0.	379.71	12.98	1.10	1.70	.44	9.80	4.23	0.00	44.70	32.30	2.70	1.00
369	1020-21	8.	1.	0.	189.00	1.26	1.10	1.70	.35	9.80	4.97	7.58	42.94	30.20	2.70	1.00
370	1020-31	13.	9.	0.	87.61	-3.13	1.10	1.70	.28	11.43	6.02	6.79	44.01	30.20	2.70	1.00
371	1021- 7	13.	10.	0.	72.12	-3.76	1.10	1.70	.49	13.72	7.14	7.05	44.05	30.20	2.70	1.00
372	1021-17	4.	10.	0.	64.38	-1.51	1.10	1.70	.57	17.15	7.62	3.17	45.05	30.20	2.70	1.00
373	1021-27	6.	10.	0.	98.86	-2.59	1.10	1.70	.39	8.57	7.62	.46	48.50	30.20	2.70	1.00
374	1022- 4	9.	10.	0.	122.14	-2.47	1.10	1.70	.42	9.80	8.79	.23	48.44	30.20	2.70	1.00
375	1022-14	10.	10.	0.	104.71	-3.35	1.10	1.70	.45	8.57	8.79	.24	47.71	30.20	2.70	1.00
376	1022-24	[illegible]	10.	0.	127.02	-2.75	1.10	1.70	.45	11.43	8.79	.27	47.26	30.20	2.70	1.00
377	1022-34	8.	10.	0.	101.32	-2.15	1.10	1.70	.47	11.43	8.79	.33	47.63	30.20	2.70	1.00
378	1023-10	9.	10.	0.	88.69	-1.45	1.10	1.70	.60	13.72	8.79	.59	47.26	30.20	2.70	1.00
379	1023-20	13.	10.	0.	125.87	-1.10	1.10	1.70	.43	9.80	8.16	1.04	46.33	30.20	2.70	1.00
380	1023-30	14.	10.	0.	163.39	-1.75	1.10	1.70	.39	11.43	7.62	1.30	46.43	30.20	2.70	1.00
381	1024- 6	11.	10.	0.	180.49	-1.85	1.10	1.70	.38	11.43	6.35	1.22	46.11	30.20	2.70	1.00
382	1024-16	11.	10.	0.	227.01	-.92	1.10	1.70	.55	9.80	7.62	1.40	46.05	30.20	2.70	1.00
383	1024-26	10.	10.	0.	207.73	.40	1.10	1.70	.30	9.80	8.79	.85	46.74	30.20	2.70	1.00
384	1025- 2	12.	10.	0.	235.59	-.08	1.10	1.70	.38	11.43	8.79	.52	46.23	30.20	2.70	1.00
385	1025-12	17.	7.	0.	200.90	-.10	1.10	1.70	.24	8.57	11.43	.66	46.25	30.20	2.70	1.00
386	1025-22	15.	6.	0.	235.88	-.28	1.10	1.70	.36	9.80	8.16	.65	45.07	30.20	2.70	1.00
387	1025-32	12.	8.	0.	251.91	.80	1.10	1.70	.45	9.80	10.39	1.01	45.72	30.20	2.70	1.00
388	1026- 8	5.	10.	0.	231.70	-.36	1.10	1.70	.61	13.72	10.39	.80	45.84	30.20	2.70	1.50
389	1026-18	3.	10.	0.	232.84	-1.24	1.10	1.70	.56	11.43	9.53	.73	46.19	30.20	2.70	1.50
390	1026-28	1.	0.	0.	211.76	-1.02	1.10	1.70	.53	11.43	8.79	.75	46.29	30.20	2.70	1.50
391	1027- 3	3.	0.	0.	195.97	-.38	1.10	1.70	.46	13.72	9.53	.73	46.13	30.20	2.70	1.50
392	1027-13	2.	0.	0.	199.37	-.65	1.10	1.70	.31	17.15	10.39	.58	46.17	30.20	2.70	1.50
393	1027-23	3.	1.	0.	161.50	-1.60	1.10	1.70	.42	13.72	10.39	.41	46.15	30.20	2.70	1.00
394	1027-33	3.	3.	0.	162.26	-1.41	1.10	1.70	.72	11.43	10.39	.44	45.17	30.20	2.70	1.00
395	1028- 9	7.	0.	0.	169.22	-.60	1.10	1.70	.63	11.43	9.53	.38	43.61	30.20	2.70	1.00
396	1028-19	7.	3.	0.	168.97	-.45	1.10	1.70	.52	11.43	8.16	.60	43.48	30.20	2.70	1.00
397	1028-29	8.	0.	0.	202.42	-.17	1.10	1.70	.42	11.43	6.35	.38	43.28	30.20	2.70	1.00
398	1029- 5	10.	9.	0.	199.64	.26	1.10	1.70	.55	11.43	8.16	.56	39.26	30.20	2.70	1.00
399	1029-15	9.	10.	0.	177.22	-.54	1.10	1.70	.76	13.72	5.72	1.04	39.38	30.20	2.70	1.00
400	1029-25	9.	10.	0.	161.04	.10	1.10	1.70	.37	13.72	5.72	.71	40.03	30.20	2.70	1.00

	TRANSECT	STRK	DFQ3	INFQ	OPDX	RSLX	TDRG	STSG	SEDS	OFS5	OFS9	ISLW	LAGW	WFQ1	WFQ3	BARS
401	1029-35	8.	9.	0.	180.74	.89	1.10	1.70	.62	9.80	5.72	1.41	38.20	30.20	2.70	1.00
402	1030-10	17.	4.	0.	200.56	1.43	1.10	1.70	.46	9.80	5.72	1.28	27.74	30.20	2.70	1.00
403	1030-20	13.	0.	0.	201.75	1.92	1.10	1.70	.50	11.43	4.97	.99	27.09	30.20	2.70	1.00
404	1030-30	10.	5.	0.	162.62	.61	1.10	1.70	.43	13.72	3.46	.80	28.71	30.20	2.70	1.00
405	1031- 6	10.	10.	0.	158.60	.27	1.10	1.70	.36	9.80	6.35	.99	27.90	30.20	2.70	1.00
406	1031-16	7.	10.	0.	158.64	1.38	1.10	1.70	.36	11.43	7.62	.94	28.39	30.20	2.70	1.00
407	1031-26	1.	10.	0.	159.85	.35	1.10	1.70	.67	13.72	8.79	.76	28.51	30.20	2.70	1.00
408	1032- 2	360.	10.	0.	147.16	-2.97	1.00	1.70	.60	13.72	10.39	.82	28.33	30.20	2.70	.67
409	1032-12	357.	10.	0.	130.17	-2.88	1.00	1.70	.52	13.72	10.39	.85	28.55	30.20	2.70	.67
410	1032-22	350.	10.	0.	146.45	-5.85	1.00	1.70	.37	17.15	11.43	.71	26.62	30.20	2.70	.67
411	1032-32	353.	10.	0.	131.01	-7.60	1.00	1.70	.46	11.43	10.39	.60	28.04	30.20	2.70	.67
412	1033- 7	352.	10.	0.	145.73	-4.69	1.00	1.70	.42	7.62	11.43	.55	28.04	30.20	2.70	.67
413	1033-17	349.	10.	0.	131.04	-2.11	1.00	1.70	.43	11.43	11.43	.44	28.16	30.20	2.70	.83
414	1033-27	350.	10.	0.	185.70	-1.75	1.00	1.70	.52	9.80	10.39	.85	27.86	30.20	2.70	.83
415	1034- 3	349.	6.	0.	235.31	-1.13	1.00	1.70	.61	9.80	10.39	1.11	27.39	30.20	2.70	.83
416	1034-13	354.	9.	0.	295.65	.04	1.00	1.70	.44	9.80	8.16	1.10	24.18	30.20	2.70	.83
417	1034-23	350.	10.	0.	291.31	.49	1.00	1.70	.45	9.80	7.14	1.31	22.07	30.20	2.70	.83
418	1034-33	350.	5.	0.	216.36	-.11	1.00	1.70	.45	13.72	8.79	1.27	22.45	30.20	2.70	1.00
419	1035- 9	349.	0.	1.	157.88	-.92	1.00	1.70	.48	17.15	7.62	1.39	23.21	30.20	2.70	1.00
420	1035-19	347.	5.	1.	105.11	-2.07	1.00	1.70	.35	7.62	10.39	.87	22.80	30.20	2.70	1.00
421	1035-29	344.	10.	1.	98.89	-2.24	1.00	1.70	.35	7.62	8.16	1.30	22.25	30.20	2.70	1.00
422	1036- 5	344.	10.	1.	78.49	-3.03	1.00	1.70	.40	9.80	9.53	1.60	22.07	30.20	2.70	1.00
423	1036-15	344.	10.	1.	64.63	-2.07	1.00	1.70	.44	9.80	8.16	1.73	22.84	30.20	2.70	1.17
424	1036-25	342.	10.	1.	122.62	-2.93	1.00	1.70	.33	9.80	7.62	1.34	23.67	30.20	2.70	1.17
425	1036-35	341.	10.	1.	86.31	-4.36	1.00	1.70	.33	11.43	7.62	1.31	23.61	30.20	2.70	1.17
426	1037-10	339.	1.	1.	101.61	-3.82	1.00	1.70	.32	17.15	10.39	1.34	24.24	30.20	2.70	1.17
427	1037-20	337.	0.	1.	262.78	-5.00	1.00	1.70	.30	17.15	10.39	1.40	22.96	30.20	2.70	1.17
428	1037-30	334.	0.	1.	194.98	-3.95	1.00	1.70	.30	11.43	9.53	.91	24.22	23.10	1.90	.83
429	1038- 5	333.	0.	1.	143.82	-2.76	1.00	1.70	.31	13.72	8.16	.88	24.12	23.10	1.90	.83
430	1038-15	335.	0.	1.	264.11	-3.13	1.00	1.70	.36	4.90	6.02	.78	18.57	23.10	1.90	.83
431	1038-25	318.	0.	1.	391.58	-18.16	1.00	1.70	.29	3.43	3.69	.22	18.82	23.10	1.90	.83
432	1039- 4	9.	0.	1.	244.99	11.10	1.00	1.70	.29	2.86	4.01	1.29	18.35	23.10	1.90	.83
433	1039-14	340.	0.	1.	291.70	24.18	1.00	1.70	.29	3.12	4.76	1.02	16.87	23.10	1.90	1.00
434	1039-24	324.	0.	1.	350.63	.92	1.00	1.70	.28	8.57	6.72	.66	17.21	23.10	1.90	1.00
435	1039-34	338.	0.	1.	269.70	-5.18	1.00	1.70	.28	9.80	7.14	.87	16.70	23.10	1.90	1.00
436	1040- 9	340.	0.	1.	236.34	-6.35	1.00	1.70	.31	17.15	10.39	1.54	16.24	23.10	1.90	1.00
437	1040-19	341.	0.	1.	171.68	-5.03	1.00	1.70	.29	13.72	9.53	2.01	15.67	23.10	1.90	1.00
438	1040-29	340.	0.	1.	136.55	-2.92	1.00	1.70	.33	8.57	9.53	1.36	15.20	23.10	1.90	1.67
439	1041- 4	341.	0.	1.	159.03	-2.52	1.00	1.70	.37	8.57	8.79	1.74	14.57	23.10	1.90	1.67
440	1041-14	341.	0.	1.	121.59	-2.85	1.00	1.70	.40	11.43	10.39	1.89	13.07	23.10	1.90	1.67
441	1041-24	340.	0.	1.	143.55	-1.80	1.00	1.70	.45	9.80	10.39	2.47	12.60	23.10	1.90	1.67
442	1041-34	337.	0.	1.	125.73	-1.15	1.00	1.70	.44	11.43	11.43	2.29	12.92	23.10	1.90	1.67
443	1042-10	335.	0.	1.	145.82	-1.74	1.00	1.70	.33	13.72	12.70	2.18	12.62	23.10	1.90	1.67
444	1042-20	336.	0.	0.	115.68	-.64	1.00	1.70	.34	13.72	11.43	2.08	12.82	23.10	1.90	1.67
445	1042-30	337.	0.	0.	145.05	-1.21	1.00	1.70	.37	11.43	11.43	1.26	13.72	23.10	1.90	1.67
446	1043- 6	336.	4.	0.	112.19	-.91	1.00	1.70	.36	13.72	12.70	.99	14.12	23.10	1.90	1.67
447	1043-16	337.	9.	0.	142.51	-.41	1.00	1.70	.33	11.43	11.43	.57	14.83	23.10	1.90	1.67
448	1043-26	337.	10.	0.	157.12	.24	1.00	1.70	.35	11.43	10.39	.60	14.02	23.10	1.90	1.00
449	1044- 2	336.	10.	0.	121.34	.39	1.00	1.70	.36	9.80	10.39	.75	13.90	23.10	1.90	1.00
450	1044-12	336.	10.	0.	115.08	-1.15	1.00	1.70	.36	11.43	10.39	.93	13.13	23.10	1.90	1.00

	TRANSECT	STRK	DFQ3	INFQ	OPDX	RSLX	TDRG	STSG	SEDS	OFS5	OFS9	ISLW	LAGW	WFQ1	WFQ3	BARS
451	1044-22	336.	10.	0.	95.40	-1.14	1.00	1.70	.35	9.80	10.39	1.00	13.27	23.10	1.90	1.00
452	1044-32	336.	10.	0.	125.14	-.91	1.00	1.70	.35	9.80	9.53	1.17	13.35	23.10	1.90	1.00
453	1045- 6	335.	10.	0.	120.61	-1.18	1.00	1.70	.35	11.43	10.39	1.15	13.49	23.10	1.90	1.33
454	1045-16	335.	10.	0.	96.36	-1.00	1.00	1.70	.35	11.43	10.39	1.40	12.62	23.10	1.90	1.33
455	1045-26	334.	10.	0.	122.17	-.54	1.00	1.70	.54	13.72	8.79	1.88	12.84	23.10	1.90	1.33
456	1046- 1	335.	10.	0.	110.35	-.30	1.00	1.70	.54	13.72	10.39	3.01	11.38	23.10	1.90	1.33
457	1046-11	335.	10.	0.	102.62	-.56	1.00	1.70	.54	9.80	8.16	2.61	11.89	23.10	1.90	1.33
458	1046-21	334.	10.	0.	98.04	-.16	1.00	1.70	.54	9.80	8.79	2.65	12.40	15.00	.90	1.67
459	1046-31	336.	10.	0.	116.22	.29	1.00	1.70	.54	13.72	16.33	2.56	13.15	15.00	.90	1.67
460	1047- 6	335.	10.	0.	124.93	.46	1.00	1.70	.41	17.15	16.33	2.68	12.33	15.00	.90	1.67
461	1047-16	335.	10.	0.	166.72	.64	1.00	1.70	.41	13.72	8.16	2.50	13.21	15.00	.90	1.67
462	1047-26	332.	10.	0.	178.59	.14	1.00	1.70	.45	13.72	9.53	2.29	14.77	15.00	.90	1.67
463	1048- 1	331.	8.	0.	132.12	-1.18	1.00	1.70	.45	13.72	7.62	1.45	14.83	15.00	.90	1.25
464	1048-11	332.	6.	0.	82.50	-2.41	1.00	1.70	.45	13.72	9.53	1.19	15.99	15.00	.90	1.25
465	1048-21	332.	7.	0.	88.74	-.97	1.00	1.70	.45	11.43	9.53	.99	17.76	15.00	.90	1.25
466	1048-31	330.	10.	0.	102.05	.31	1.00	1.70	.40	11.43	8.79	5.06	17.37	15.00	.90	1.25
467	1049- 6	332.	7.	0.	90.15	-.90	1.00	1.70	.40	13.72	11.43	4.63	26.67	15.00	.90	1.25
468	1049-16	332.	6.	0.	93.88	-1.38	1.00	1.70	.40	11.43	10.39	4.27	27.43	15.00	.90	1.25
469	1049-26	335.	8.	0.	110.06	-1.40	1.00	1.70	.43	13.72	9.53	3.66	27.56	15.00	.90	1.25
470	1050- 2	335.	10.	0.	107.54	-.77	1.00	1.70	.46	13.72	9.53	3.23	27.69	15.00	.90	1.25
471	1050-12	337.	10.	0.	167.00	-.26	1.00	1.70	.46	8.57	8.16	2.97	5.30	15.00	.90	1.25
472	1050-22	337.	10.	0.	80.94	.24	1.00	1.70	.46	7.62	7.62	2.80	4.71	15.00	.90	1.25
473	1050-32	335.	10.	0.	87.40	.06	1.00	1.70	.50	8.57	7.62	2.59	4.88	15.00	.90	1.17
474	1051- 7	338.	10.	0.	114.75	-.45	1.00	1.70	.50	7.62	8.79	2.41	5.00	15.00	.90	1.17
475	1051-17	338.	10.	0.	87.22	.01	1.00	1.70	.50	9.80	12.70	1.39	5.27	15.00	.90	1.17
476	1051-27	338.	10.	0.	92.20	.19	1.00	1.60	.50	8.57	11.43	1.11	6.05	15.00	.90	1.17
477	1052- 4	340.	10.	0.	93.18	-.06	1.00	1.60	.50	9.80	11.43	.98	5.79	15.00	.90	1.17
478	1052-14	339.	10.	0.	110.54	-.06	1.00	1.60	.54	8.57	10.39	.99	6.16	15.00	.90	1.17
479	1052-24	340.	10.	0.	213.67	-.17	1.00	1.60	.54	8.57	10.39	1.09	6.46	15.00	.90	1.17
480	1052-34	343.	10.	0.	158.14	-.48	1.00	1.60	.65	8.57	8.79	.99	6.46	20.00	1.30	1.17
481	1053-10	342.	10.	0.	231.84	-.48	1.00	1.60	.76	6.86	6.35	.69	6.61	20.00	1.30	1.17
482	1053-20	341.	10.	0.	235.85	.01	1.00	1.60	.76	7.62	7.62	.65	7.13	20.00	1.30	1.17
483	1053-30	339.	10.	0.	132.41	-.65	1.00	1.60	.76	9.80	8.16	.55	7.10	20.00	1.30	1.17
484	1054- 5	338.	10.	0.	84.95	-.55	1.00	1.60	.70	9.80	8.79	.37	5.86	20.00	1.30	1.17
485	1054-15	339.	10.	0.	103.13	-.50	1.00	1.60	.70	7.62	7.14	.27	6.11	20.00	1.30	1.17
486	1054-25	341.	10.	0.	110.21	-.28	1.00	1.60	.70	8.57	6.72	.76	5.73	20.00	1.30	1.17
487	1054-35	342.	10.	0.	123.81	-.28	1.00	1.60	.70	8.57	7.62	1.95	5.29	20.00	1.30	1.17
488	1055-11	342.	10.	0.	152.56	.03	1.00	1.60	.73	6.86	7.62	2.00	5.67	20.00	1.30	1.33
489	1055-21	348.	10.	0.	220.51	-.22	1.00	1.60	.73	7.62	7.62	2.10	5.64	20.00	1.30	1.33
490	1055-31	349.	10.	0.	251.17	.17	1.00	1.60	.73	7.62	6.72	1.43	6.22	20.00	1.30	1.33
491	1056- 6	343.	10.	0.	245.18	-.34	1.10	1.60	.50	7.62	7.14	1.07	5.23	20.00	1.30	1.33
492	1056-16	343.	10.	0.	373.92	-.96	1.10	1.60	.50	6.86	6.35	.95	5.42	20.00	1.30	1.33
493	1056-26	343.	10.	0.	354.43	-1.48	1.10	1.60	.50	6.86	6.35	.92	4.85	20.00	1.30	1.50
494	1057- 2	345.	10.	0.	325.58	-.91	1.10	1.60	.50	6.23	6.02	1.94	5.62	20.00	1.30	1.50
495	1057-12	345.	9.	0.	344.18	-1.39	1.10	1.60	.23	6.23	5.72	3.66	6.35	20.00	1.30	1.50
496	1057-22	345.	10.	0.	310.65	-1.69	1.10	1.60	.23	7.62	6.35	3.17	6.43	20.00	1.30	1.50
497	1057-32	345.	10.	0.	335.44	-2.34	1.10	1.60	.23	8.57	6.35	3.78	6.47	20.00	1.30	1.50
498	1058- 8	345.	10.	0.	327.62	-2.59	1.10	1.60	.23	7.62	6.35	.95	6.78	20.00	1.30	1.33
499	1058-18	346.	9.	0.	270.21	-2.31	1.10	1.60	.20	8.57	6.35	.77	7.28	20.00	1.30	1.33
500	1058-28	347.	2.	0.	292.84	-1.33	1.10	1.60	.20	8.57	6.72	.85	7.47	20.00	1.30	1.33

	TRANSECT	STRK	DFQ3	INFQ	OPDX	RSLX	TDRG	STSG	SEDS	OFS5	OFS9	ISLW	LAGW	WFQ1	WFQ3	BARS
501	1059- 4	348.	4.	0.	258.45	-.84	1.10	1.60	.20	7.62	6.72	1.04	7.46	20.00	1.30	1.33
502	1059-14	349.	10.	0.	225.23	-2.33	1.10	1.60	.27	6.86	5.72	.74	8.17	20.00	1.30	1.33
503	1059-24	349.	10.	0.	212.95	-3.05	1.10	1.60	.34	6.86	5.72	1.65	8.11	20.00	1.30	1.33
504	1059-34	348.	10.	0.	301.19	-2.40	1.10	1.60	.34	6.86	6.02	1.34	7.28	20.00	1.30	1.33
505	1060-10	348.	7.	0.	186.00	-2.09	1.10	1.60	.34	7.62	5.72	.85	7.14	20.00	1.30	1.33
506	1060-20	350.	9.	0.	134.56	-1.14	1.10	1.60	.26	6.23	5.72	.93	6.55	20.00	1.30	1.33
507	1060-30	350.	8.	0.	179.60	-1.65	1.10	1.60	.26	7.62	5.20	.94	7.30	20.00	1.30	1.33
508	1061- 5	348.	9.	0.	229.20	-3.34	1.10	1.60	.26	6.86	5.20	.65	7.19	20.00	1.30	1.33
509	1061-15	349.	5.	0.	260.84	-4.40	1.10	1.60	.26	6.86	5.44	2.04	5.84	20.00	1.30	1.33
510	1061-25	348.	7.	0.	335.64	-4.02	1.10	1.60	.26	6.23	4.76	2.19	5.67	20.00	1.30	1.33
511	1051-35	346.	5.	0.	343.42	-3.14	1.10	1.60	.26	6.23	4.57	2.02	9.28	20.00	1.30	1.33
512	1062-10	347.	2.	0.	349.60	-3.08	1.10	1.60	.26	6.86	5.44	1.62	9.94	20.00	1.30	1.33
513	1062-20	346.	0.	0.	253.60	-2.69	1.10	1.60	.26	6.86	5.72	2.71	10.36	20.00	1.30	1.33
514	1062-30	346.	3.	0.	197.50	-2.06	1.10	1.60	.26	7.62	6.72	1.68	13.00	20.00	1.30	1.33
515	1063-11	347.	6.	0.	160.86	-1.20	1.10	1.60	.26	7.62	6.72	2.23	12.88	20.00	1.30	1.33
516	1063-21	349.	5.	0.	179.20	-1.07	1.10	1.60	.26	7.62	8.16	2.05	3.97	20.00	1.30	1.33
517	1063-31	350.	9.	0.	174.48	-1.13	1.10	1.60	.26	9.80	8.79	1.89	3.10	20.00	1.30	1.33
518	1064-12	349.	10.	0.	187.57	-1.56	1.10	1.60	.26	11.43	8.79	1.74	2.79	20.00	1.30	1.67
519	1064-22	351.	10.	0.	145.21	-1.12	1.10	1.60	.26	9.80	7.62	1.16	3.35	20.00	1.30	1.67
520	1064-32	351.	10.	0.	156.92	-1.37	1.10	1.60	.26	8.57	7.62	1.13	3.22	20.00	1.30	1.67
521	1065- 8	350.	10.	0.	174.70	-.63	1.10	1.60	.27	9.80	6.35	1.38	2.72	20.00	1.30	1.67
522	1065-18	352.	10.	0.	156.67	.22	1.10	1.60	.26	6.86	6.35	2.62	1.26	20.00	1.30	1.67
523	1065-28	351.	9.	0.	152.81	.37	1.10	1.60	.25	6.86	5.72	1.46	3.33	20.00	1.30	1.50
524	1066- 3	349.	10.	0.	151.49	-.22	1.10	1.70	.26	4.90	5.44	1.89	2.60	20.00	1.30	1.50
525	1066-13	351.	10.	0.	236.00	-.07	1.10	1.70	.26	9.80	5.20	1.28	3.23	20.00	1.30	1.50
526	1066-23	350.	10.	0.	233.16	-.23	1.10	1.70	.16	11.43	4.57	1.44	9.30	20.00	1.30	1.50
527	1066-33	349.	9.	0.	233.16	-1.16	1.10	1.70	.16	8.57	8.79	1.88	8.46	20.00	1.30	1.50
528	1067- 8	345.	10.	0.	212.76	-1.21	1.10	1.70	.16	9.80	8.16	1.30	9.10	20.00	1.30	1.50
529	1067-18	343.	10.	0.	150.50	-.89	1.10	1.70	.16	7.62	7.62	1.26	8.00	20.00	1.30	1.50
530	1067-28	343.	10.	0.	130.42	.25	1.10	1.70	.16	8.57	9.53	1.90	7.38	20.00	1.30	1.50
531	1068- 3	342.	10.	0.	288.84	1.47	1.10	1.70	.16	8.57	7.14	2.03	7.36	20.00	1.30	1.50
532	1068-13	340.	10.	0.	381.91	2.03	1.10	1.70	.16	9.80	7.14	1.71	7.59	20.00	1.30	1.50
533	1068-23	340.	10.	0.	353.67	1.49	1.10	1.80	.25	8.57	6.35	1.91	6.80	20.00	1.30	1.33
534	1068-33	337.	10.	0.	320.87	1.55	1.10	1.80	.25	8.57	4.97	1.57	6.66	20.00	1.30	1.33
535	1069- 8	338.	10.	0.	291.08	-1.13	1.10	1.80	.25	9.80	5.20	1.36	6.83	20.00	1.30	1.33
536	1069-18	338.	10.	0.	193.91	-1.75	1.10	1.80	.25	11.43	4.57	.63	6.53	20.00	1.30	1.33
537	1069-28	337.	10.	0.	197.76	-1.52	1.10	1.80	.25	11.43	6.35	.51	5.82	20.00	1.30	1.33
538	1070- 3	336.	10.	0.	199.74	-1.92	1.10	1.80	.25	9.80	7.62	.41	4.63	20.00	1.30	1.00
539	1070-13	337.	10.	0.	205.24	-2.35	1.10	1.80	.25	9.80	7.62	.43	4.18	20.00	1.30	1.00
540	1070-23	341.	10.	0.	211.57	-2.40	1.10	1.80	.25	9.80	7.62	.58	2.27	20.00	1.30	1.00
541	1070-33	343.	10.	0.	182.52	-2.87	1.10	1.80	.25	9.80	8.16	.58	2.10	20.00	1.30	1.00
542	1071- 8	344.	10.	0.	179.49	-1.82	1.10	1.80	.25	11.43	9.53	.69	2.93	20.00	1.30	1.00
543	1071-18	344.	10.	1.	180.24	-1.68	1.10	1.90	.25	11.43	10.39	1.10	0.00	20.00	1.30	1.00
544	1071-28	345.	10.	1.	206.68	-.61	1.10	1.90	.25	11.43	10.39	1.26	0.00	20.00	1.30	1.00
545	1072- 3	342.	10.	1.	232.08	-.01	1.10	1.90	.25	11.43	8.79	1.41	0.00	20.00	1.30	1.00
546	1072-13	342.	10.	1.	174.50	.09	1.10	1.90	.25	13.72	6.02	1.06	0.00	20.00	1.30	1.00
547	1072-23	342.	10.	1.	167.66	.65	1.10	1.90	.25	13.72	6.02	1.02	0.00	20.00	1.30	1.00
548	1072-33	343.	10.	1.	163.00	.94	1.00	1.90	.24	13.72	7.14	.99	0.00	20.00	1.30	1.00
549	1073- 8	345.	10.	1.	119.08	-.17	1.00	1.90	.22	13.72	5.20	.73	0.00	20.00	1.30	1.00
550	1073-18	347.	10.	1.	128.92	-.34	1.00	1.90	.22	13.72	3.18	.79	0.00	20.00	1.30	1.00

	TRANSECT	STRK	DFQ3	INFQ	OPDX	RSLX	TDRG	STSG	SEDS	OFS5	OFS9	ISLW	LAGW	WFQ1	WFQ3	BARS
551	1073-28	346.	10.	1.	100.65	.28	1.00	1.90	.24	13.72	3.46	.61	0.00	20.00	1.30	1.00
552	1074- 3	347.	10.	1.	89.16	.13	1.00	1.90	.25	13.72	3.27	.54	0.00	20.00	1.30	1.00
553	1074-13	348.	10.	1.	113.83	-.89	1.00	1.90	.25	13.72	2.79	.69	0.00	20.00	1.30	1.00
554	1074-23	350.	10.	1.	73.07	-.94	1.00	1.90	.31	11.43	2.54	.45	0.00	20.00	1.30	1.00
555	1074-33	350.	9.	1.	96.51	-.01	1.00	1.90	.31	13.72	2.93	.59	0.00	20.00	1.30	1.00
556	1075- 8	349.	10.	1.	39.23	-.14	1.00	1.90	.31	17.15	2.48	.34	0.00	20.00	1.30	1.00
557	1075-18	346.	10.	1.	35.41	-.56	1.00	1.90	.22	13.72	2.48	.22	0.00	20.00	1.30	1.00
558	1075-28	347.	10.	1.	40.09	-.46	1.00	1.90	.22	17.15	2.48	.24	0.00	20.00	1.30	1.00
559	1076- 3	348.	10.	1.	41.59	-.75	1.00	1.90	.22	13.72	2.48	.25	0.00	20.00	1.30	1.00
560	1076-13	347.	10.	1.	44.43	-.70	1.00	1.90	.22	13.72	2.60	.27	0.00	20.00	1.30	1.00
561	1076-23	346.	10.	1.	64.49	-.02	1.00	1.90	.25	13.72	2.72	.39	0.00	20.00	1.30	1.00
562	1076-33	349.	10.	1.	74.71	-.32	.90	1.90	.25	13.72	2.86	.46	0.00	20.00	1.30	1.00
563	1077- 9	349.	10.	2.	81.76	1.02	.90	1.90	.25	13.72	3.27	.50	0.00	20.00	1.30	1.67
564	1077-19	349.	10.	2.	87.50	1.07	.90	1.90	.25	11.43	3.57	.53	0.00	20.00	1.30	1.67
565	1078-13	339.	10.	2.	93.50	.99	.90	1.90	.31	4.57	5.20	.57	0.00	20.00	1.30	1.67
566	1078-23	308.	10.	2.	60.20	-1.28	.90	1.90	.31	7.62	8.79	.36	0.00	20.00	1.30	1.67
567	1079-14	290.	10.	1.	39.49	-1.08	.80	1.90	.31	9.80	11.43	.24	0.00	20.00	1.30	1.67
568	1079-24	277.	10.	1.	41.30	-.67	.80	1.90	.31	11.43	14.29	.25	0.00	20.00	1.30	1.67
569	1080- 8	266.	10.	1.	152.09	1.07	.80	1.90	.31	22.86	28.58	.92	0.00	20.00	1.30	1.67
570	1080-18	227.	10.	1.	172.00	2.93	.70	1.90	.31	34.29	12.70	1.05	0.00	20.00	1.30	1.67
571	1080-28	225.	10.	1.	79.14	2.21	.70	1.90	.31	11.43	7.62	.48	0.00	20.00	1.30	1.67
572	1081- 5	244.	10.	1.	63.84	.88	.70	1.90	.31	13.72	2.38	.39	0.00	20.00	1.30	1.67
573	1081-15	259.	10.	1.	66.26	-.06	.60	1.90	.31	11.43	2.33	.40	0.00	20.00	1.30	1.67
574	1081-25	248.	10.	1.	105.14	1.37	.60	1.90	.31	6.86	1.97	.64	0.00	20.00	1.30	1.67
575	1081-35	230.	2.	1.	78.33	1.85	.60	2.00	.31	5.28	1.76	.48	0.00	20.00	1.30	1.67
576	1082-11	148.	0.	2.	138.08	10.78	.90	2.00	.18	11.43	8.16	1.49	2.01	20.00	1.30	1.67
577	1082-21	104.	1.	2.	88.86	-2.05	.90	2.00	.18	6.86	3.94	1.45	2.36	20.00	1.30	1.67
578	1082-31	76.	4.	2.	117.77	-2.72	1.00	2.00	.18	6.23	.65	1.07	[illegible]	20.00	1.30	.50
579	1083-12	43.	0.	2.	174.82	-6.29	1.00	2.00	.18	3.61	.86	1.54	1.92	20.00	1.30	.50
580	1083-22	47.	0.	0.	99.27	-1.95	1.00	2.00	.18	2.98	.89	0.00	3.10	20.00	1.30	.50
581	1083-32	47.	0.	0.	--	--	1.00	1.90	.18	1.49	.87	0.00	2.78	21.40	1.50	.50
582	1084-12	128.	0.	3.	109.50	-6.97	1.00	1.90	.18	1.96	.81	.07	2.27	21.40	1.50	.50
583	1084-22	67.	0.	4.	79.06	-.22	1.10	1.90	.15	.99	.87	.70	3.27	21.40	1.50	.25
584	1084-32	61.	0.	4.	75.41	2.14	1.10	1.90	.16	1.34	.94	1.11	4.33	21.40	1.50	.25
585	1085- 9	41.	0.	4.	70.42	.55	1.10	1.90	.16	1.67	1.03	.84	[illegible]	21.40	1.50	.25
586	1085-19	41.	0.	3.	111.23	1.28	1.10	1.90	.15	1.63	1.02	.75	[illegible]	21.40	1.50	.25
587	1085-29	40.	0.	3.	153.28	-.19	1.10	1.90	.15	1.67	.94	.38	7.32	21.40	1.50	.25
588	1086- 7	42.	0.	4.	115.74	-5.54	1.10	1.90	.18	1.49	.97	.58	8.53	21.40	1.50	1.25
589	1086-17	41.	0.	4.	98.38	-8.25	1.10	1.90	.16	1.43	1.15	1.04	8.88	20.00	1.30	1.25
590	1086-27	45.	0.	4.	120.62	-14.95	1.10	1.90	.15	1.63	1.15	1.57	9.81	20.00	1.30	1.25
591	1087- 6	48.	0.	4.	121.97	-12.69	1.20	1.90	.18	1.56	1.22	1.04	11.03	20.00	1.30	1.25
592	1087-16	49.	0.	4.	92.11	-9.07	1.20	1.90	.16	1.52	1.24	1.28	11.31	20.00	1.30	1.25
593	1087-26	49.	0.	4.	73.00	-8.11	1.20	1.90	.15	2.54	1.33	.96	8.50	20.00	1.30	1.00
594	1088- 3	13.	1.	3.	123.22	-10.87	1.20	1.90	.16	1.80	1.36	2.85	2.12	20.00	1.30	1.00
595	1088-13	46.	7.	4.	111.76	-6.31	1.20	1.90	.18	1.91	1.34	2.18	4.94	20.00	1.30	1.00
596	1088-23	43.	3.	5.	156.25	-4.68	1.20	1.90	.19	2.14	1.61	1.52	6.21	20.00	1.30	1.00
597	1088-33	345.	8.	0.	183.25	4.86	1.20	1.90	.16	1.37	1.41	0.00	9.11	20.00	1.30	.50
598	1089-11	29.	3.	7.	114.28	-2.78	1.20	1.90	.15	1.37	1.52	2.50	9.54	20.00	1.30	.50
599	1089-21	16.	2.	7.	85.41	-22.65	1.20	1.90	.16	1.20	1.41	1.35	10.93	20.00	1.30	[illegible]
600	1089-31	351.	1.	0.	156.59	-39.92	1.20	1.90	.19	1.04	1.27	0.00	12.01	20.00	1.30	.50

	TRANSECT	STRK	DFQ3	INFQ	OPDX	RSLX	TDRG	STSG	SEDS	OFS5	OFS9	ISLW	LAGW	WFQ1	WFQ3	BARS
601	1090-G6	5.	0.	0.	191.11	-18.40	1.20	1.90	.19	.97	1.12	0.00	11.77	20.00	1.30	.50
602	1090-16	34.	0.	7.	171.07	-12.96	1.20	1.90	.15	.93	1.09	.18	11.40	20.00	1.30	.50
603	1090-26	14.	0.	8.	160.58	-7.59	1.20	1.90	.15	.97	1.11	.20	11.17	20.00	1.30	1.00
604	1091- 2	11.	3.	8.	159.07	-1.56	1.20	1.90	.15	.94	1.12	.24	11.51	20.00	1.30	1.00
605	1091-12	5.	2.	8.	140.34	-2.44	1.20	1.80	.16	1.02	1.06	.30	11.09	21.40	1.50	1.00
606	1091-22	340.	0.	7.	130.51	-3.89	1.20	1.80	.16	.91	1.10	.20	10.82	21.40	1.50	1.00
607	1091-32	340.	7.	0.	143.39	43.55	1.20	1.80	.15	1.06	1.11	0.00	11.63	31.40	1.50	1.00
608	1092-14	74.	0.	7.	101.17	-9.21	1.20	1.80	.18	1.12	1.13	.10	12.92	21.40	1.50	1.00
609	1092-24	47.	3.	7.	90.17	-4.83	1.20	1.80	.16	1.43	1.18	.05	13.36	21.40	1.50	1.00
610	1092-34	40.	6.	7.	119.84	-8.16	1.20	1.80	.15	1.34	1.22	.12	13.41	21.40	1.50	1.00
611	1093- 9	39.	2.	6.	73.08	-6.46	1.20	1.80	.14	1.37	1.43	.27	13.59	21.40	1.50	1.00
612	1093-19	52.	0.	6.	94.96	-5.61	1.20	1.80	.15	1.67	1.48	.49	13.60	21.40	1.50	1.00
613	1093-29	44.	0.	6.	70.82	-3.19	1.20	1.80	.15	1.71	1.50	.49	13.48	21.40	1.50	1.00
614	1094- 5	42.	0.	5.	143.21	1.54	1.20	1.80	.25	1.59	1.50	.45	13.66	21.40	1.50	1.00
615	1094-15	14.	0.	0.	143.38	4.16	1.20	1.80	.15	1.22	1.59	0.00	13.84	21.40	1.50	1.00
616	1094-25	17.	0.	0.	219.06	-15.20	1.20	1.80	.18	1.06	1.47	0.00	13.73	21.40	1.50	1.00
617	1094-35	17.	0.	0.	231.38	-61.22	1.20	1.80	.18	1.06	1.47	0.00	13.54	21.40	1.50	1.00
618	1095-10	42.	0.	6.	322.88	-17.39	1.20	1.80	.15	1.11	1.66	.24	12.80	21.40	1.50	.50
619	1095-20	27.	2.	6.	232.66	5.67	1.20	1.80	.15	1.20	1.52	.16	13.38	21.40	1.50	.50
620	1095-30	20.	0.	4.	229.50	-5.04	1.20	1.80	.18	1.09	1.47	.18	12.50	21.40	1.50	.50
621	1096- 8	34.	0.	4.	166.05	-9.11	1.20	1.80	.16	1.29	1.63	.16	12.04	21.40	1.50	.50
622	1096-18	34.	0.	2.	171.27	-6.03	1.20	1.80	.18	2.29	1.81	.18	11.70	21.40	1.50	.50
623	1096-28	34.	3.	2.	118.33	.02	1.20	1.80	.16	2.29	1.84	.21	12.04	21.40	1.50	.75
624	1097- 7	34.	3.	2.	132.58	4.82	1.20	1.80	.18	2.45	1.97	3.04	8.36	21.40	1.50	.75
625	1097-17	36.	2.	2.	143.33	5.69	1.20	1.80	.16	2.36	1.97	2.90	8.53	21.40	1.50	.75
626	1097-27	53.	0.	2.	406.66	3.80	1.20	1.80	.20	2.45	2.20	2.44	9.27	21.40	1.50	.75
627	1098- 5	13.	0.	2.	492.34	8.68	1.20	1.80	.19	2.36	2.43	3.54	9.83	21.40	1.50	.75
628	1098-15	21.	0.	2.	400.67	12.69	1.20	1.80	.18	2.02	2.60	1.22	11.66	21.40	1.50	1.00
629	1098-25	345.	0.	2.	371.59	2.37	1.20	1.80	.19	2.08	2.38	.46	10.97	21.40	1.50	1.00
630	1099-01	336.	3.	0.	352.93	-2.68	1.20	1.80	.16	1.59	2.04	0.00	9.88	21.40	1.50	1.00
631	1099-11	59.	0.	1.	165.66	-10.68	1.20	1.80	.16	1.40	1.79	.49	9.27	21.40	1.50	1.00
632	1099-21	38.	0.	2.	140.71	-12.93	1.20	1.80	.15	2.86	2.12	.41	8.98	21.40	1.50	1.00
633	1099-31	27.	0.	2.	132.47	-13.98	1.20	1.80	.15	3.43	2.16	.69	8.53	21.40	1.50	.25
634	1100- 6	25.	0.	2.	123.50	-13.02	1.20	1.80	.16	3.61	2.38	1.20	7.88	21.40	1.50	.25
635	1100-16	26.	7.	2.	90.25	-11.01	1.20	1.80	.18	4.03	2.24	1.27	7.80	21.40	1.50	.25
636	1100-26	28.	4.	2.	60.15	-8.81	1.20	1.80	.18	6.23	2.20	3.05	5.91	21.40	1.50	.25
637	1101- 1	30.	1.	2.	43.25	-7.05	1.20	1.80	.19	5.28	2.29	1.67	7.57	21.40	1.50	.25
638	1101-11	30.	1.	2.	38.16	-5.22	1.20	1.80	.18	6.23	2.33	2.65	6.20	21.40	1.50	1.00
639	1101-21	29.	6.	2.	40.50	-5.64	1.20	1.80	.18	4.03	3.01	2.72	6.23	21.40	1.50	1.00
640	1101-31	28.	9.	2.	52.33	-6.74	1.20	1.80	.16	3.27	2.60	2.00	6.25	21.40	1.50	1.00
641	1102- 6	32.	8.	2.	66.52	-6.34	1.20	1.80	.16	2.86	3.46	1.74	7.05	21.40	1.50	1.00
642	1102-16	36.	6.	2.	50.63	-5.30	1.20	1.80	.16	2.86	3.57	1.69	7.05	21.40	1.50	1.00
643	1102-26	42.	0.	2.	127.70	-2.58	1.20	1.80	.20	2.98	3.81	.94	6.35	21.40	1.50	.75
644	1103- 9	340.	0.	2.	314.80	5.64	1.20	1.80	.21	1.59	2.24	0.00	9.22	20.00	1.30	.75
645	1103-19	360.	0.	2.	189.25	-11.31	1.20	1.80	.21	1.67	2.20	.33	7.79	20.00	1.30	.75
646	1103-29	5.	0.	2.	182.23	-.55	1.20	1.80	.23	2.45	2.29	.88	6.58	20.00	1.30	.75
647	1104- 4	9.	0.	2.	232.10	-2.18	1.20	1.80	.25	2.74	2.33	.63	5.65	20.00	1.30	.75
648	1104-14	19.	0.	3.	137.00	-6.97	1.20	1.80	.23	2.64	2.43	.21	5.06	20.00	1.30	1.00
649	1104-24	25.	0.	4.	128.18	-5.60	1.20	1.80	.25	4.03	2.66	3.11	1.93	20.00	1.30	1.00
650	1104-34	20.	0.	4.	127.17	-4.33	1.10	1.80	.24	[illegible]	2.72	3.70	1.32	20.00	1.30	1.00

	TRANSECT	STRK	DFQ3	INFQ	OPDX	RSLX	TDRG	STSG	SEDS	OFS5	OFS9	ISLW	LAGW	WFQ1	WFQ3	BARS
651	1105- 9	18.	0.	4.	115.24	-4.50	1.10	1.80	.30	5.28	3.09	3.31	1.30	20.00	1.30	1.00
652	1105-19	19.	2.	4.	108.06	-4.86	1.10	1.80	.28	5.72	3.18	2.26	2.09	20.00	1.30	1.00
653	1105-29	20.	4.	4.	90.92	-5.31	1.10	1.80	.25	4.57	3.36	2.87	1.22	20.00	1.30	1.25
654	1106-21	20.	7.	4.	83.09	-8.70	1.10	1.80	.21	4.03	3.69	2.46	1.54	20.00	1.30	1.25
655	1106-31	15.	6.	0.	203.88	-17.81	1.10	1.80	.22	4.29	3.94	0.00	3.78	20.00	1.30	1.25
656	1107-12	2.	0.	0.	90.00	-11.38	1.10	1.80	.22	3.81	.34	0.00	3.17	20.00	1.30	1.25
657	1107-22	2.	10.	0.	104.73	-16.19	1.10	1.80	.22	3.43	3.18	.06	2.12	20.00	1.30	1.25
658	1107-32	20.	0.	4.	103.16	-17.60	1.10	1.80	.22	3.61	3.46	.24	2.51	20.00	1.30	.50
659	1108-23	21.	0.	4.	74.67	-18.66	1.10	1.80	.26	3.81	3.36	.43	2.21	20.00	1.30	.50
660	1108-33	22.	0.	4.	98.51	-25.38	1.10	1.80	.30	3.43	2.86	.04	2.22	20.00	1.30	.50
661	1109- 8	25.	0.	5.	108.87	-27.97	1.10	1.80	.30	3.81	2.93	0.00	2.18	20.00	1.30	.50
662	1109-18	36.	10.	0.	112.32	-22.32	1.10	1.80	.30	2.21	2.38	0.00	2.29	20.00	1.30	.50
663	1109-28	40.	0.	5.	126.25	-9.30	1.10	1.80	.25	3.81	2.72	1.19	1.18	20.00	1.30	.50
664	1110- 3	26.	0.	5.	116.09	-6.58	1.10	1.80	.24	5.72	3.18	1.21	1.07	20.00	1.30	.50
665	1110-13	26.	0.	5.	101.91	-4.99	1.10	1.80	.25	5.28	2.48	.87	1.54	20.00	1.30	.50
666	1110-23	22.	0.	5.	131.16	-8.49	1.10	1.80	.23	5.28	3.69	.52	1.98	20.00	1.30	.50
667	1110-33	23.	0.	5.	134.34	1.41	1.10	1.80	.27	5.72	3.94	.29	1.85	20.00	1.30	.50
668	1111- 9	27.	0.	5.	119.20	-7.39	1.10	1.80	.25	4.90	3.69	.11	1.92	20.00	1.30	.50
669	1111-19	26.	0.	4.	103.99	-10.24	1.10	1.80	.22	5.28	3.69	.27	1.86	20.00	1.30	.50
670	1111-29	30.	0.	4.	144.73	-11.22	1.10	1.80	.18	4.90	3.69	1.55	.58	20.00	1.30	.50
671	1112- 6	34.	0.	5.	88.03	-9.26	1.10	1.80	.25	5.72	3.57	1.62	.54	20.00	1.30	.50
672	1112-16	35.	0.	4.	97.21	-7.50	1.10	1.80	.28	4.90	3.81	1.49	.91	21.40	1.50	.50
673	1112-26	35.	2.	4.	146.50	-5.67	1.10	1.80	.40	4.57	3.18	.61	1.92	21.40	1.50	.75
674	1113- 1	36.	10.	4.	110.76	-4.37	1.10	1.80	.40	4.90	3.27	.98	1.74	21.40	1.50	.75
675	1113-11	38.	10.	3.	75.33	-1.86	1.10	1.80	.35	4.90	3.27	1.05	2.02	21.40	1.50	.75
676	1113-21	40.	10.	3.	65.17	0.00	1.10	1.80	.35	4.90	3.18	1.50	1.69	21.40	1.50	.75
677	1113-31	41.	10.	3.	50.50	-.04	1.10	1.80	.55	4.57	2.48	1.01	2.50	21.40	1.50	.75
678	1114- 8	43.	10.	3.	38.00	-2.44	1.10	1.80	.45	4.29	2.12	.84	3.17	21.40	1.50	.75
679	1114-18	49.	10.	2.	31.16	-3.04	1.10	1.80	.30	3.61	1.84	1.52	2.60	21.40	1.50	.75
680	1114-28	52.	10.	2.	32.95	-2.53	1.10	1.80	.20	3.27	1.76	2.27	2.60	21.40	1.50	.75
681	1115- 5	65.	10.	2.	91.70	5.34	1.10	1.80	.19	3.43	1.71	1.61	3.81	21.40	1.50	.75
682	1115-15	50.	0.	2.	160.46	9.62	1.10	1.80	.17	1.63	.99	.79	5.38	21.40	1.50	.75
683	1115-25	34.	4.	0.	160.89	-23.22	1.10	1.80	.16	1.05	.97	0.00	7.19	21.40	1.50	.75
684	1115-35	102.	8.	0.	--	—	1.10	1.80	.16	2.74	1.68	.74	5.51	21.40	1.50	.75
685	1116-11	135.	3.	1.	229.36	21.29	1.10	1.80	.16	4.03	1.91	.74	2.19	21.40	1.50	.75
686	1116-21	127.	6.	1.	567.36	8.14	1.10	1.80	.16	2.74	2.48	1.06	2.48	21.40	1.50	.75
687	1116-31	120.	0.	1.	533.28	10.54	1.10	1.80	.27	3.43	2.01	.79	3.01	21.40	1.50	.75
688	1117-13	54.	0.	1.	138.76	1.48	1.10	1.80	.38	2.74	3.46	.34	3.08	21.40	1.50	.67
689	1117-23	43.	0.	1.	152.54	-4.93	1.10	1.80	.33	3.43	3.27	.21	2.74	21.40	1.50	.67
690	1117-33	23.	1.	1.	157.08	-5.69	1.10	1.80	.32	4.90	2.86	.27	3.02	21.40	1.50	.67
691	1118- 8	30.	0.	1.	166.60	-5.57	1.10	1.80	.37	5.28	3.69	3.44	.87	21.40	1.50	.67
692	1118-18	31.	2.	1.	160.41	-4.81	1.10	1.80	.39	6.86	3.57	4.27	6.66	21.40	1.50	.67
693	1118-28	24.	9.	1.	138.22	-4.00	1.10	1.80	.41	6.23	5.44	2.87	7.91	21.40	1.50	1.00
694	1119- 3	26.	10.	1.	132.34	-4.82	1.10	1.80	.33	6.86	5.20	1.91	8.13	21.40	1.50	1.00
695	1119-13	25.	0.	0.	162.04	-3.23	1.10	1.80	.36	7.62	6.02	1.20	9.69	21.40	1.50	1.00
696	1119-23	26.	0.	0.	156.49	-1.81	1.10	1.80	.33	8.57	9.53	1.29	9.88	21.40	1.50	1.00
697	1119-33	23.	0.	0.	217.57	-.76	1.10	1.80	.36	11.43	6.02	.88	10.45	21.40	1.50	1.00
698	1120- 8	27.	0.	0.	394.53	-.45	1 .0	1.60	.48	9.80	4.76	.70	9.94	21.40	1.50	1.00
699	1120-18	27.	0.	0.	721.87	-.24	1.10	1.80	.30	8.57	4.23	1.58	8.75	21.40	1.50	1.00
700	1120-28	29.	0.	0.	1025.44	0.00	1.10	1.80	.35	6.86	3.69	1.52	8.94	21.40	1.50	1.00

	TRANSECT	STRK	DFQ3	INFO	OPDX	RSLX	TDRG	STSG	SEDS	OFS5	OFS9	ISLW	LAGW	WFQ1	WFQ3	BARS
701	1121- 3	30.	0.	0.	1057.26	.99	1.10	1.80	.31	7.62	3.94	1.39	8.16	21.40	1.50	1.00
702	1121-13	35.	0.	0.	971.79	1.53	1.10	1.80	.39	9.80	3.69	1.65	8.42	21.40	1.50	1.00
703	1121-23	34.	0.	0.	688.88	1.07	1.10	1.80	.37	11.43	5.44	2.91	7.41	21.40	1.50	1.00
704	1121-33	31.	0.	0.	253.80	.29	1.10	1.80	.33	8.57	5.72	2.44	6.30	21.40	1.50	1.00
705	1122- 8	30.	0.	0.	251.97	-.05	1.10	1.80	.25	9.80	5.44	2.32	7.88	21.40	1.50	1.00
706	1122-18	33.	0.	0.	237.57	-1.12	1.10	1.80	.28	9.80	6.35	1.43	8.37	26.90	3.80	1.00
707	1122-28	31.	0.	0.	234.19	-1.53	1.10	1.80	.31	8.57	5.72	1.99	7.85	26.90	3.80	1.00
708	1123- 3	33.	8.	0.	242.09	-1.73	1.10	1.80	.40	9.80	5.72	.49	11.41	26.90	3.80	1.00
709	1123-13	34.	6.	0.	208.12	-.43	1.10	1.80	.32	11.43	5.72	.91	10.79	26.90	3.80	1.00
710	1123-23	30.	10.	0.	317.66	-.05	1.10	1.80	.32	11.43	5.44	.70	9.58	26.90	3.80	1.00
711	1123-33	30.	10.	0.	308.04	-.32	1.10	1.80	.31	17.15	8.79	.82	10.17	26.90	3.80	1.00
712	1124- 8	30.	10.	0.	315.90	-.20	1.10	1.80	.30	13.72	11.43	1.91	9.29	26.90	3.80	1.00
713	1124-18	30.	10.	0.	259.54	-.60	1.10	1.80	.32	13.72	11.43	2.01	7.50	26.90	3.80	1.00
714	1124-28	30.	10.	0.	381.38	-.65	1.10	1.80	.32	13.72	12.70	1.52	6.77	26.90	3.80	1.00
715	1125- 3	28.	2.	0.	419.12	-1.40	1.10	1.80	.33	13.72	12.70	.76	7.47	26.90	3.80	1.00
716	1125-13	29.	10.	0.	283.40	-1.18	1.10	1.80	.29	17.15	16.33	1.58	6.92	26.90	3.80	1.00
717	1125-23	27.	9.	0.	239.80	-1.06	1.00	1.80	.34	17.15	14.29	1.37	8.17	26.90	3.80	1.00
718	1125-33	25.	9.	0.	460.84	-1.08	1.00	1.80	.31	17.15	12.70	1.69	7.67	26.90	3.80	1.00
719	1126- 8	24.	4.	0.	744.90	-.79	1.00	1.80	.31	17.15	11.43	1.25	8.13	25.70	3.00	1.00
720	1126-18	24.	0.	0.	741.78	-.83	1.00	1.80	.42	13.72	9.53	.97	8.66	25.70	3.00	1.00
721	1126-28	20.	0.	0.	745.60	-.79	1.00	1.80	.36	13.72	9.53	1.22	8.41	25.70	3.00	1.00
722	1127- 3	18.	6.	0.	485.04	-1.03	1.00	1.80	.43	13.72	8.79	1.19	8.41	25.70	3.00	1.00
723	1127-13	16.	8.	0.	352.42	-.92	1.00	1.80	.40	22.86	10.39	1.34	7.25	25.70	3.00	.60
724	1127-23	18.	9.	0.	426.60	-.42	1.00	1.80	.38	22.86	9.53	1.55	6.85	25.70	3.00	.60
725	1127-33	15.	10.	0.	647.51	-1.03	1.00	1.80	.37	17.15	12.70	1.60	7.21	25.70	3.00	.60
726	1128- 8	16.	8.	0.	369.80	-.82	1.00	1.80	.49	17.15	16.33	1.54	7.13	25.70	3.00	.60
727	1128-18	17.	8.	0.	288.62	-.61	1.00	1.80	.58	17.15	11.43	1.55	7.23	25.70	3.00	.60
728	1128-28	15.	8.	0.	336.02	-.59	1.00	1.80	.58	17.15	9.53	1.65	7.64	25.70	3.00	.40
729	1129- 3	17.	10.	0.	315.07	-.37	1.00	1.80	.41	17.15	9.53	.70	7.86	25.70	3.00	.40
730	1129-13	19.	9.	0.	350.11	.44	1.00	1.80	.43	17.15	12.70	1.19	2.35	25.70	3.00	.40
731	1129-23	21.	10.	0.	315.31	-.71	1.00	1.80	.37	17.15	16.33	1.61	2.17	25.70	3.00	.40
732	1129-33	19.	9.	0.	336.52	-.83	1.00	1.80	.41	22.86	14.29	.86	3.26	25.70	3.00	.40
733	1130- 8	19.	9.	0.	312.88	-1.55	1.00	1.80	.37	22.86	14.29	.76	1.91	25.70	3.00	.40
734	1130-18	21.	9.	1.	232.21	-1.36	1.00	1.80	.39	22.86	16.33	1.19	1.23	25.70	3.00	.40
735	1130-28	22.	10.	1.	233.91	-.53	1.00	1.80	.46	22.86	12.70	.85	1.21	25.70	3.00	.40
736	1131- 3	20.	10.	1.	270.43	-1.51	1.00	1.80	.36	17.15	12.70	.60	1.57	25.70	3.00	.40
737	1131-13	22.	10.	1.	243.34	-2.06	1.00	1.80	.40	17.15	10.39	.57	1.60	25.70	3.00	.40
738	1131-23	20.	10.	1.	209.57	-3.54	1.00	1.80	.36	34.29	10.39	.39	1.40	25.70	3.00	.40
739	1131-33	22.	9.	1.	260.45	-2.36	1.00	1.80	.38	68.58	12.70	.46	1.35	25.70	3.00	.40
740	1132- 8	20.	5.	1.	357.01	-4.20	1.00	1.80	.40	34.29	10.39	.75	1.19	25.70	3.00	.40
741	1132-18	17.	2.	1.	323.80	-5.51	1.00	1.80	.37	34.29	6.72	.29	1.20	25.70	3.00	.40
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743	1133- 5	18.	0.	1.	250.87	-8.86	1.00	1.80	.38	17.15	5.72	.55	.38	25.70	3.00	.40
744	1133-15	23.	0.	1.	221.20	-9.15	1.00	1.80	.33	13.72	4.76	.45	.79	25.70	3.00	.40
745	1133-25	37.	3.	1.	239.99	-7.15	1.00	1.80	.36	3.27	4.40	.35	.30	25.70	3.00	.40
746	1134-11	20.	7.	1.	119.76	3.19	1.00	1.80	.36	34.29	10.39	.57	.60	25.70	3.00	.40
747	1134-21	17.	10.	1.	83.89	1.55	1.00	1.80	.35	22.86	14.29	.47	1.10	25.70	3.00	.40
748	1134-31	20.	7.	1.	95.20	-.28	1.00	1.80	.35	22.86	12.70	.72	1.19	25.70	3.00	.80
749	1135- 6	20.	10.	1.	135.57	-.09	1.00	1.80	.35	22.86	14.29	.49	3.40	25.70	3.00	.80
750	1135-16	16.	10.	1.	140.04	.01	1.10	1.80	.35	22.86	10.39	.44	4.86	25.70	3.00	.80

	TRANSECT	STRK	DFQ3	INFO	OPDX	RSLX	TDRG	STSG	SEDS	OFS5	OFS9	ISLW	LAGW	WFQ1	WFQ3	BARS
751	1135-26	13.	10.	1.	156.03	-.23	1.10	1.80	.35	34.29	9.53	.35	5.05	25.70	3.00	.80
752	1136- 1	15.	10.	1.	162.45	0.00	1.10	1.80	.35	22.86	7.14	.51	5.10	25.70	3.00	.80
753	1136-11	13.	10.	1.	164.61	-.23	1.10	1.80	.35	22.86	7.62	.90	2.46	25.70	3.00	.80
754	1136-21	13.	8.	1.	144.59	-1.45	1.10	1.80	.35	34.29	11.43	.61	2.99	25.70	3.00	.80
755	1136-31	14.	4.	1.	140.33	-1.07	1.10	1.80	.35	34.29	9.53	1.34	2.50	25.70	3.00	.80
756	1137- 6	10.	8.	1.	150.17	-.99	1.10	1.80	.35	34.29	16.33	1.11	3.51	25.70	3.00	.80
757	1137-16	10.	10.	1.	147.30	-.70	1.10	1.90	.35	34.29	14.29	1.30	1.62	25.70	3.00	.80
758	1137-26	8.	10.	0.	125.56	-.59	1.10	1.90	.35	13.72	14.29	1.42	1.62	25.70	3.00	.60
759	1138- 1	6.	10.	0.	126.05	-.51	1.10	1.90	.35	34.29	16.33	1.32	1.80	25.70	3.00	.60
760	1138-11	5.	10.	0.	117.98	-.50	1.10	1.90	.35	22.86	19.05	1.17	2.10	25.70	3.00	.60
761	1138-21	2.	10.	0.	130.53	-.85	1.10	1.90	.35	34.29	19.05	.76	.51	25.70	3.00	.60
762	1138-31	359.	10.	0.	149.28	-.82	1.10	1.90	.35	34.29	19.05	.30	1.85	25.70	3.00	.60
763	1139- 6	360.	10.	0.	146.27	-1.06	1.10	1.90	.37	34.29	22.86	.58	2.07	25.70	3.00	.60
764	1139-16	359.	10.	0.	135.[illegible]1	-1.25	1.10	1.90	.39	34.29	22.86	.57	1.02	25.70	3.00	.60
765	1139-26	354.	10.	0.	153.52	-.92	1.10	1.90	.39	34.29	19.05	.43	1.71	25.70	3.00	.60
766	1140- 1	357.	10.	1.	151.94	-1.17	1.10	1.90	.39	22.86	12.70	.93	0.00	25.70	3.00	.60
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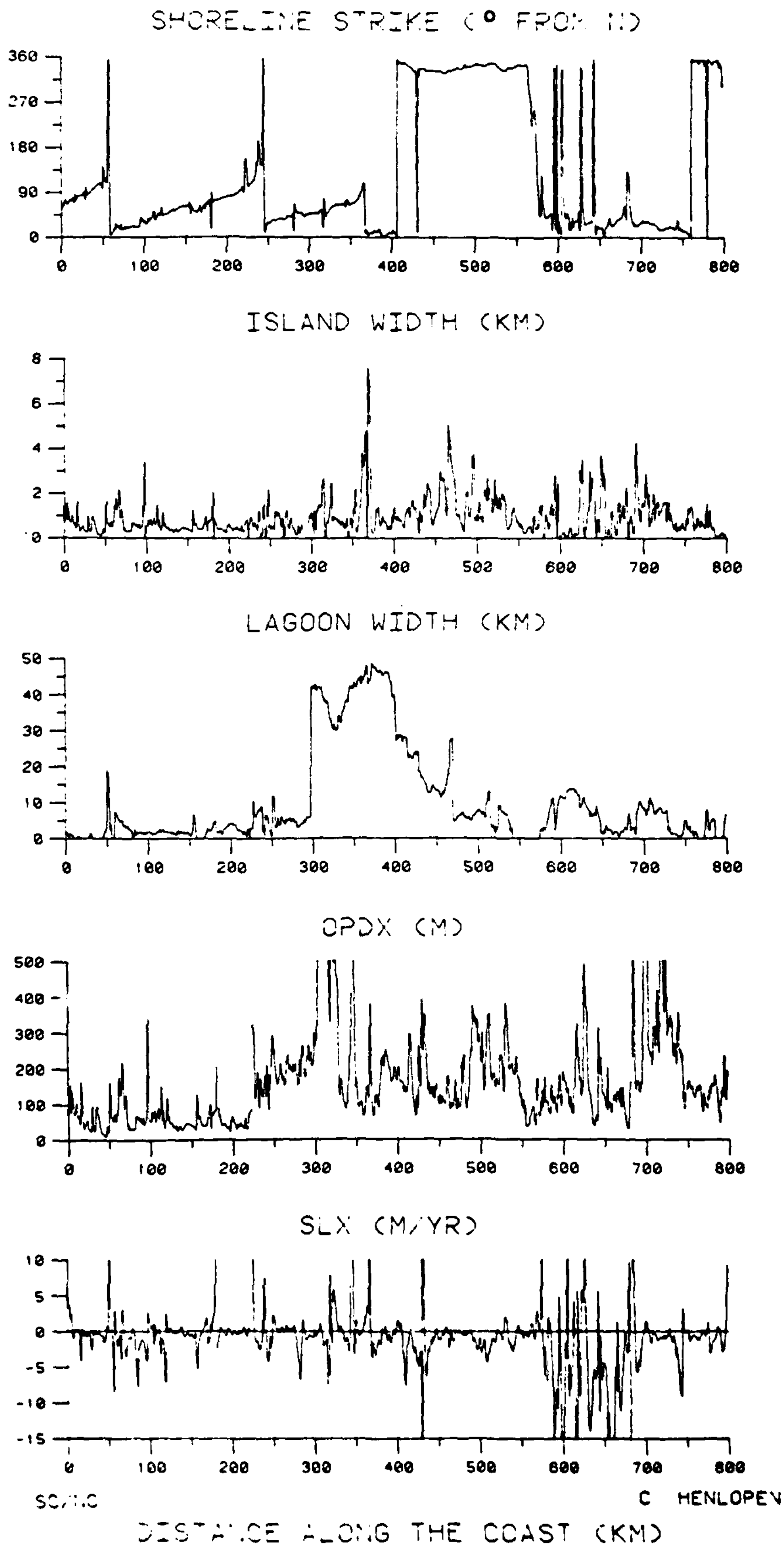
768	1140-21	358.	10.	1.	108.94	-.36	1.10	1.90	.39	34.29	19.05	.66	0.00	25.70	3.00	.20
769	1140-31	356.	10.	1.	75.97	-.47	1.10	1.90	.39	34.29	16.33	.46	0.00	25.70	3.00	.20
770	1141- 6	358.	9.	1.	95.12	.23	1.20	1.90	.39	34.29	22.86	.58	0.00	25.70	3.00	.20
771	1141-16	350.	10.	1.	134.40	.14	1.20	1.90	.39	34.29	16.33	.82	0.00	25.70	3.00	.20
772	1141-26	355.	10.	1.	103.87	-.24	1.20	1.90	.39	17.15	10.39	.63	0.00	25.70	3.00	.20
773	1142- 1	359.	10.	1.	98.02	-.72	1.20	1.90	.28	34.29	5.20	.60	0.00	25.70	3.00	.20
774	1142-11	357.	10.	1.	92.24	-.45	1.20	2.00	.28	34.29	8.16	.56	0.00	25.70	3.00	.20
775	1142-21	355.	10.	1.	87.23	-.33	1.20	2.00	.28	22.86	9.53	.43	3.69	25.70	3.00	.20
776	1142-31	357.	10.	1.	124.20	.41	1.20	2.00	.28	34.29	8.16	.61	5.41	25.70	3.00	.20
777	1143- 6	358.	10.	1.	111.85	1.33	1.20	2.00	.28	68.58	10.39	1.58	8.13	25.70	3.00	.20
778	1143-16	345.	8.	1.	149.53	-1.96	1.20	2.00	.30	5.72	6.63	.76	7.17	25.70	3.00	.20
779	1143-26	356.	10.	1.	125.68	-3.13	1.20	2.00	.33	34.29	10.39	.46	2.35	25.70	3.00	.20
780	1144- 2	354.	10.	1.	157.49	-2.77	1.20	2.00	.33	22.86	8.79	.63	2.15	25.70	3.00	.20
781	1144-12	1.	10.	1.	152.73	-1.73	1.20	2.00	.33	68.58	7.62	1.30	4.49	25.70	3.00	.20
782	1144-22	360.	10.	1.	154.32	-1.44	1.20	2.00	.33	34.29	3.81	.82	4.41	25.70	3.00	.20
783	1144-32	360.	10.	1.	148.42	-1.25	1.20	2.00	.36	34.29	5.72	.52	5.06	25.70	3.00	.20
784	1145- 7	356.	10.	1.	183.09	-1.21	1.20	2.00	.36	68.58	8.79	.39	5.34	25.70	3.00	.20
785	1145-17	353.	8.	1.	165.49	-1.03	1.20	2.00	.36	34.29	11.43	.48	5.04	25.70	3.00	.20
786	1145-27	351.	10.	1.	142.74	-.62	1.20	2.00	.36	34.29	16.33	.41	5.34	25.70	3.00	.20
787	1146- 4	348.	10.	1.	130.09	-.09	1.20	2.00	.36	34.29	22.86	.13	0.00	25.70	3.00	.20
788	1146-14	355.	10.	2.	76.94	.58	1.20	2.00	.47	68.58	22.86	.08	0.00	25.70	3.00	.20
789	1146-24	355.	10.	2.	77.86	.62	1.20	2.00	.47	34.29	28.58	.08	0.00	25.70	3.00	.20
790	1146-34	356.	10.	1.	45.46	.34	1.20	2.00	.47	34.29	19.05	.05	0.00	25.70	3.00	.20
791	1147- 9	355.	10.	1.	104.02	.08	1.20	2.00	.52	34.29	19.05	.10	0.00	25.70	3.00	.20
792	1147-19	357.	10.	1.	120.17	-1.36	1.20	2.00	.52	34.29	11.43	.12	0.00	25.70	3.00	.20
793	1147-29	356.	9.	1.	145.74	-2.61	1.20	2.00	.52	34.29	11.43	.15	0.00	25.70	3.00	.20
794	1148- 4	359.	10.	1.	120.70	-2.84	1.20	2.00	.52	34.29	12.70	.12	0.00	25.70	3.00	.20
795	1148-14	342.	10.	1.	235.78	-2.56	1.20	2.00	.37	34.29	16.33	.24	0.00	25.70	3.00	.20
796	1148-24	352.	9.	1.	231.09	-1.34	1.20	2.00	.37	22.86	6.02	.23	0.00	25.70	3.00	.20
797	1149- 3	347.	10.	1.	120.22	-.83	1.20	2.00	.37	22.86	6.02	.12	0.00	25.70	3.00	.20
798	1149-13	344.	10.	1.	108.79	-.28	1.20	2.00	.37	9.80	14.29	.11	4.08	25.70	3.00	.20
799	1149-23	303.	3.	1.	196.55	3.39	1.20	2.00	.24	34.29	38.10	.20	5.35	25.70	3.00	.20
800	1149-33	310.	0.	0.	177.00	9.20	1.20	2.00	.24	137.16	114.30	0.00	6.66	25.70	3.00	.20


SHORELINE STRIKE (° FROM N)
ISLAND WIDTH (KM)
LAGOON WIDTH (KM)
OPDX (M)
SLX (M/YR)
C HENLOPEN
DISTANCE ALONG THE COAST (KM)

AD-A128 994 MID-ATLANTIC MICROTIDAL BARRIER COAST CLASSIFICATION (U) VIRGINIA UNIV CHARLOTTESVILLE DEPT OF ENVIRONMENTAL SCIENCES R C KOCHEL ET AL. MAY 83 TR-27 2/2

UNCLASSIFIED N00014-81-K-0033 F/G 8/6 NL

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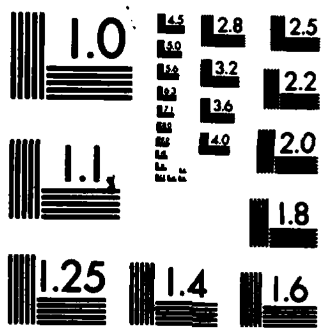
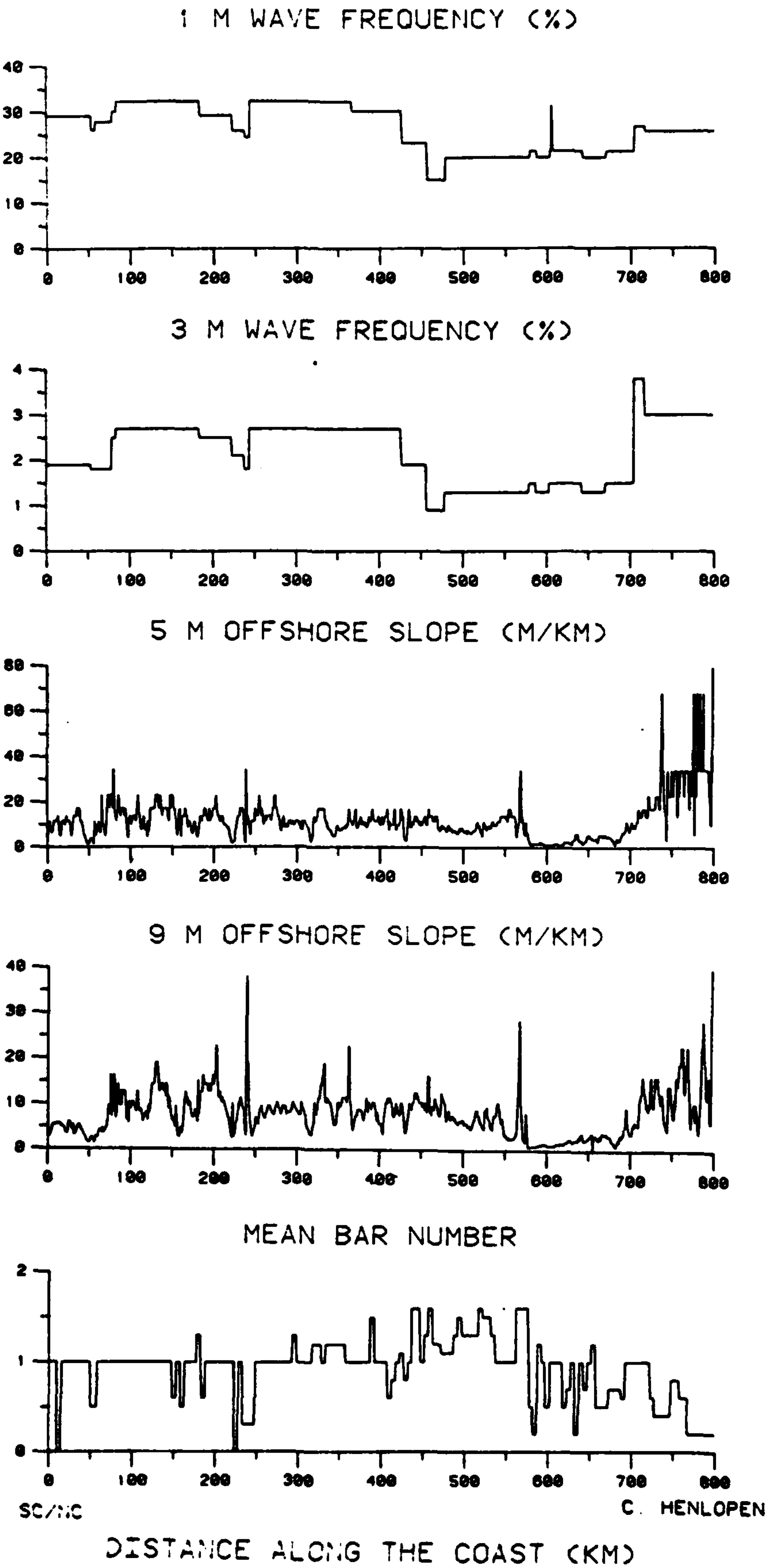
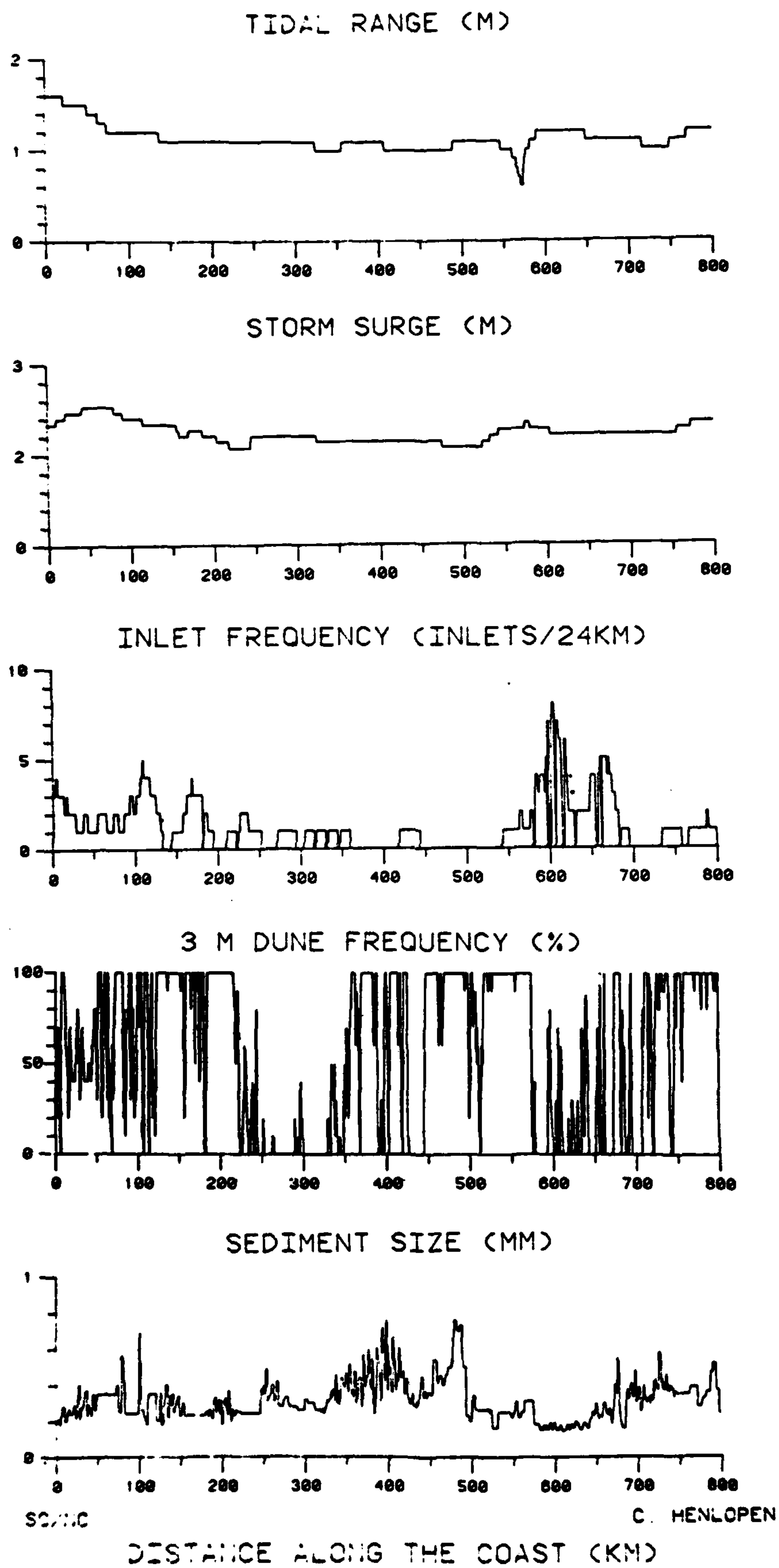

1.0
2.8
2.5
3.2
2.2
3.6
4.0
2.0
1.1
1.8
1.25
1.4
1.6


1 M WAVE FREQUENCY (%)
3 M WAVE FREQUENCY (%)
5 M OFFSHORE SLOPE (M/KM)
9 M OFFSHORE SLOPE (M/KM)
MEAN BAR NUMBER
0
100
200
300
400
500
600
700
800
SC/NC
C. HENLOPEN
DISTANCE ALONG THE COAST (KM)



TIDAL RANGE (M)
0
1
2
0
100
200
300
400
500
600
700
800
STORM SURGE (M)
0
2
3
INLET FREQUENCY (INLETS/24KM)
0
5
10
3 M DUNE FREQUENCY (%)
0
50
100
SEDIMENT SIZE (MM)
0
1
C. HENLOPEN
DISTANCE ALONG THE COAST (KM)

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Mid-Atlantic Barrier Islands
Coastal Classification
Coastal Geomorphology
Coastal Processes
Principal Components Analysis
Correlation
Regional Spatial Patterns

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Data for twenty-seven geomorphic and coastal-process attributes were collected at 1-km intervals for 800 kilometers of the mid-Atlantic barrier coast between Cape Henlopen, Delaware, and the North Carolina-South Carolina border. Correlation and principal components analysis was run on fifteen of these attributes to classify the coast.

(Continued)

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20. Local subregions (between 55 km and 190 km in length) showed organization and interrelationships. These relationships are not as clear when the entire 800-km data set is considered in the same analysis, indicating that coastal geomorphic and process systems are in adjustment to local environmental conditions to a greater extent than they are to regional conditions.

The large number of variables resulted in a classification of the mid-Atlantic coast into twenty-four distinct barrier types based on process and morphology. A coarser classification of the area identifies seven types based on attributes of coastal strike, sediment size, offshore slope, wave frequency, shoreline erosion, inlet frequency, and offshore bars.

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0101	2	NAVAL OCEANOGRAPHIC OFFICE LIBRARY
0101	3	XXXXXXXXXXXXXXXXXXXXXXXX NAVOCEANO - NSTL STATION
0101	4	XXXXXXXXXXXXXXXXXXXXXXXX BAY ST. LOUIS, MISSISSIPPI 39522
0102	1	NAVAL OCEANOGRAPHIC OFFICE
0102	2	XXXXXXXXX NSTL STATION
0102	3	XXXXXXXXXXXXXXXXXXXXXXXX BAY ST. LOUIS, MISSISSIPPI 39522
0103	1	CHIEF OF NAVAL OPERATIONS
0103	2	OP 987P1
0103	3	DEPARTMENT OF THE NAVY
0103	4	WASHINGTON, D. C. 20350
0104	1	OCEANOGRAPHER OF THE NAVY
0104	2	HOFFMAN II BUILDING
0104	3	200 STOVALL STREET
0104	4	ALEXANDRIA, VIRGINIA 22322
0105	1	NAVAL ACADEMY LIBRARY
0105	2	U. S. NAVAL ACADEMY
0105	3	ANNAPOLIS, MARYLAND 21402
0106	1	COMMANDING OFFICER
0106	2	NAVAL COASTAL SYSTEMS LABORATORY
0106	3	PANAMA CITY, FLORIDA 32401
0107	1	LIBRARIAN
0107	2	NAVAL INTELLIGENCE
0107	3	SUPPORT CENTER
0107	4	4301 SUITLAND ROAD
0107	5	WASHINGTON, D. C. 20390

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0112	4	MONTEREY, CALIFORNIA 93940
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0201	2	MARINE CORPS DEVELOPMENT AND
0201	3	EDUCATIONAL COMMAND
0201	4	QUANTICO, VIRGINIA 22134
0202	1	DR. A. L. SLAFKOSKY
0202	2	SCIENTIFIC ADVISOR
0202	3	COMMANDANT OF THE MARINE CORPS
0202	4	CODE MC-RD-1
0202	5	WASHINGTON, D. C. 20380
1001	1	DEFENSE INTELLIGENCE AGENCY
1001	2	CENTRAL REFERENCE DIVISION
1001	3	CODE RDS-3
1001	4	WASHINGTON, D. C. 20301
1002	1	DIRECTOR
1002	2	DEFENSE MAPPING TOPOGRAPHIC CENTER
1002	3	ATTN= CODE 50200
1002	4	WASHINGTON, D. C. 20315
1003	1	COMMANDING OFFICER
1003	2	U.S. ARMY ENGINEERING
1003	3	TOPOGRAPHIC LABORATORY
1003	4	ATTN= ETL-ST
1003	5	FORT BELVOIR, VIRGINIA 22060
1005	1	CHIEF, WAVE DYNAMICS DIVISION
1005	2	USAE-WES
1005	3	P. O. BOX 631
1005	4	VICKSBURG, MISSISSIPPI 39180
2003	1	NATIONAL OCEANOGRAPHIC DATA
2003	2	CENTER ID764
2003	3	ENVIRONMENTAL DATA SERVICES
2003	4	NOAA
2003	5	WASHINGTON, D. C. 20235
2005	1	CENTRAL INTELLIGENCE AGENCY
2005	2	ATTENTION OCR/DD-PUBLICATIONS
2005	3	WASHINGTON, D. C. 20505

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2007	2	ADVANCED TECHNOLOGY DIVISION
2007	3	DEFENSE MAPPING AGENCY (DELETED)
2007	4	NAVAL OBSERVATORY
2007	5	WASHINGTON, D. C. 20390
5001	1	MINISTERIALDIREKTOR DR. F. WEVER
5001	2	RUE/FO
5001	3	BUNDESMINISTERIUM DER VERTEIDIGUNG
5001	4	HARDTHOEHE
5001	5	D-5300 BONN, WEST GERMANY
5002	1	OBERREGIERUNGSRAT DR. ULLRICH
5002	2	RUE/FO
5002	3	BUNDESMINISTERIUM DER VERTEIDIGUNG
5002	4	HARDTHOEHE
5002	5	D-5300 BONN, WEST GERMANY
5003	1	MR. TAGE STRARUP
5003	2	DEFENCE RESEARCH ESTABLISHMENT
5003	3	OSTERBROGADES KASERNE
5003	4	DK-2100 KOBENHAVN O, DENMARK
5302	1	IR. M. W. VAN BATENBERG
5302	2	PHYSISCH LABORATORIUM TNO
5302	3	OUDE WAALSDORPER WEG 63, DEN HAAG
5302	4	NETHERLANDS
8002	1	COASTAL STUDIES INSTITUTE
8002	2	LOUISIANA STATE UNIVERSITY
8002	3	BATON ROUGE, LOUISIANA 70803
8003	1	DR. CHOULE J. SONU
8003	2	TEKMARINE, INC.
8003	3	37 AUBURN AVENUE
8003	4	SIERRA MADRE, CA 91024
9001	1	DR. LESTER A. GERHARDT
9001	2	RENNSSELAER POLYTECHNIC INSTITUTE
9001	3	TROY, NEW YORK 12181
9002	1	MR. FRED THOMSON
9002	2	ENVIRONMENTAL RESEARCH INSTITUTE
9002	3	P.O. BOX 618
9002	4	ANN ARBOR, MICHIGAN 48107

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9004	2	SIMON FRASER UNIVERSITY
9004	3	DEPARTMENT OF GEOGRAPHY
9004	4	BURNABY 2, B. C., CANADA
9005	1	DR. ROBERT DOLAN
9005	2	DEPARTMENT OF ENVIRONMENTAL SCIENCES
9005	3	UNIVERSITY OF VIRGINIA
9005	4	CHARLOTTESVILLE, VIRGINIA 22903